

WORLD

SYNTHETIC

NOVEMBER, 1941

TECHNOLOGY DEPT:



Sterling-S

GODFREY L. CABOT, INC., BOSTON, U.S.A.

CHOOSE THE RIGHT ACCELERATOR

NO ONE ACCELERATOR CAN BE THE BEST FOR EVERY PURPOSE

We Suggest —

FOR GR-S CARCASSES

MBTS-BARAK
*0.75 — 1.0

because it produces low heat build-up, flat curing stocks that retain their tear resistance and do not stiffen with over-curing.

FOR GR-S TREADS

2-MT-ACCELERATOR 808
*0.875 — 0.25

because this combination produces treads that are extremely resistant to crack and cut growth and at the same time are cool running. Accelerator 2-MT-808 treads are easy on the carcass.

FOR GR-I INNER TUBES

THIONEX-POLYAC
*1.0 — 0.5

because tubes made with this acceleration cure faster and have better properties, particularly lower permanent set than can be obtained by any other acceleration.

FOR GR-S CAMELBACK

ZENITE B
*1.7

because of its simplicity of handling, its freedom from scorching, the excellent wear of the cured tread and the storage stability of the uncured stock.

FOR GR-S FOOTWEAR

THIONEX-MBTS
*0.5 — 0.5

because when used in equal parts this combination provides good processing safety and a high state of cure together with excellent aging.

FOR GR-S PROOFED GOODS

THIONEX-MBTS
*0.5 — 0.5

because of its processing safety, flat curing curve and excellent aging.

FOR GR-S HEELS AND SOLES

MBTS-THIONEX
*1.0 — 0.1

because it combines economy and processing safety with a fast rate of cure.

FOR GR-S WIRE INSULATION AND JACKET STOCKS

ZENITE-THIONEX
*2.0 — 0.6 to 1.0


because this combination is safe processing, cures rapidly in C. V. equipment, gives good physical and electrical values.

*Amounts based on 100 parts of elastomer



RUBBER CHEMICALS DIVISION

BETTER THINGS FOR BETTER LIVING . . . Through Chemistry

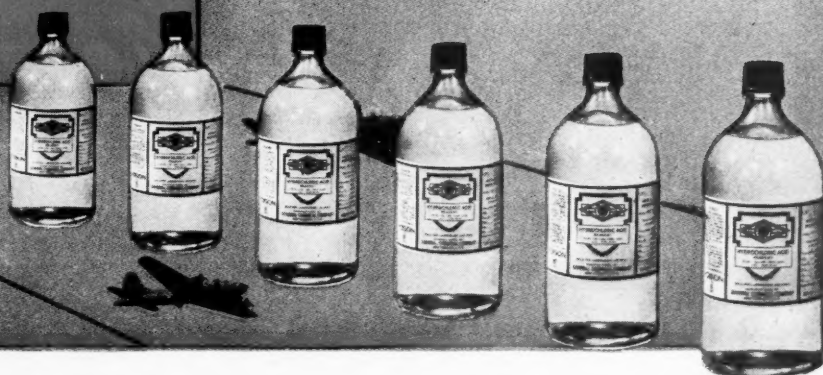


quality
IN QUANTITY

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DETROIT



General Chemical "B&A" Reagent Acids and Ammonia

Quality in quantity shapes success...increases product potentialities. That's why, wherever *reagent grade mineral acids or ammonia in commercial quantities* are specified for industrial operations, General Chemical "B&A" high purity products are an outstanding choice nation-wide.

These reagents from America's foremost producer of mineral acids conform to exacting A.C.S. specifications. Their quality and purity are the result of General Chemical's progressive research and advanced reagent production technique, combined with invaluable "know-how" gained during almost half a century's manufacture of basic chemicals for industry.

Specify and rely on General Chemical "B&A" Reagent Acids and Ammonia for your operations. Remember...their dependability has been "proved in production" by America's leading manufacturers!



GENERAL CHEMICAL COMPANY

40 RECTOR STREET, NEW YORK 6, N. Y.

Technical Service Offices: Atlanta • Baltimore • Boston • Bridgeport (Conn.) • Buffalo • Charlotte (N. C.) • Chicago • Cleveland • Denver • Detroit • Houston • Kansas City • Milwaukee • Minneapolis • New York • Philadelphia • Pittsburgh • Providence (R. I.) • St. Louis • Utica (N. Y.)

Pacific Coast Technical Service Offices:

Los Angeles • San Francisco • Seattle, Wenatchee and Yakima (Wash.)

In Canada: The Nichols Chemical Co., Ltd. • Montreal • Toronto • Vancouver



General Chemical Reagent Acids and Ammonia are produced by the Company's Baker & Adamson Division, makers of laboratory reagents and fine chemicals since 1882. The experience of this Division with high quality chemicals embraces over 1,000 purity products.

"B&A" Sulfuric Acid, Reagent, A.C.S.

Sp. Gr. 1.84

"B&A" Hydrochloric Acid, Reagent, A.C.S.

Sp. Gr. 1.18-1.19

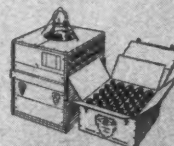
"B&A" Nitric Acid, Reagent, A.C.S.

Sp. Gr. 1.42

"B&A" Ammonium Hydroxide, Reagent, A.C.S.

Sp. Gr. .90

"B&A" Acetic Acid Glacial, Reagent, A.C.S.



Quantities: "B&A" Reagent Acids and Ammonia are available in carboys as well as in five-pint or one-pound bottles, which are obtainable in case lots or less.

Stocked at key locations throughout the nation.



PHILBLACK A

**New Type Black
Saves Operating
Time—Improves
Finished Product**

Four of the many definite processing advantages of Philblack A, which reduce operating costs and increase volume output, are:

1. Reduction of processing time
2. Attainment of excellent black dispersion
3. Lowering of excessively high processing temperatures
4. Improvement in ease and smoothness of extrusion

In carcass stocks Philblack A is particularly desirable because of its easy processing, low hysteresis, and high reinforcing properties. Laboratory tests and actual application have fully verified its outstanding qualities in both natural and synthetic rubber. Write today for your free copy of the new fully informative book, "Philblack A."

PHILLIPS PETROLEUM COMPANY

Philblack Division, First Central Tower, Akron, Ohio

WHEN YOU HAVE A CHOICE CHOOSE THE BEST

With the recent rapid progress in conversion to synthetic products, compounds have had to be a compromise between the best and the most available.

Now that the best is available there is no reason for not specifying

BJF

The Naugatuck accelerator for

**TIRES • CAMELBACK • SOLES and HEELS
AND ALL PRODUCTS WHERE**

- Abrasion
- Crack Growth
- Flat Curing Range
- Safety in Processing

ARE IMPORTANT FOR SERVICE

WRITE FOR BULLETIN: "BJF—ACCELERATOR FOR GR-S"

PROCESS • ACCELERATE • PROTECT
with Naugatuck Chemicals

Naugatuck Chemical

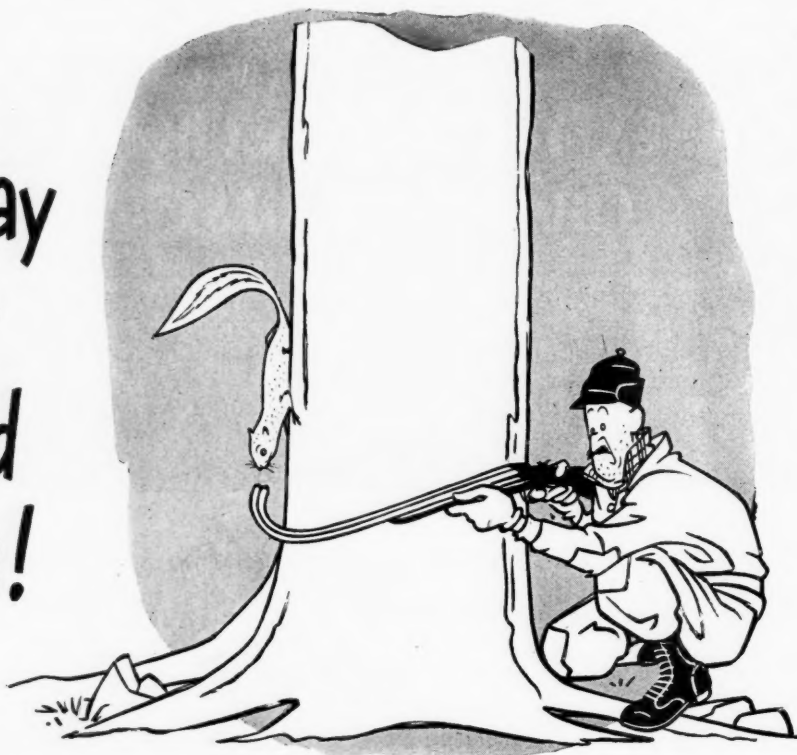
DIVISION OF UNITED
ROCKEFELLER CENTER



STATES RUBBER COMPANY
NEW YORK 20, N. Y.

IN CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Elmira, Ont.

**New way
to get
around
curves!**



**Revolutionary new design enables
Crown Zippers to slide freely around
sharp curves—slide faster, smoother!**

Today, Crown engineers, working in the field with Air Corps, Ordnance and Quartermaster officers, have developed a zipper that is making history—a zipper that actually slides freely around sharp curves.

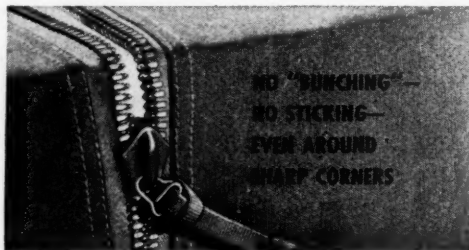
Tomorrow, when the last shot has been fired, Crown's war experience will result in tremendous improvements in rubber goods applications—on boots, raincoats and raincoats, boat covers, and on many other important items.

For a Crown Zipper's ability to take curves is only one of many basic advantages it has over ordinary, old-style zippers. (See complete list below.)

That is why Crown Zippers are in action today throughout the world—on airplane gun turrets,

armored trucks, tents, sleeping bags and many other military items where human life depends on instant, unflinching action.

Remember, when you turn to post-war: Crown designers will adapt—or, if necessary, *create*—special zipper applications to meet special needs. Remember: you can zip faster, further, more securely, with a Crown Zipper!



CROWN

ZIPPERS
are 5 ways better



1. Takes sharp curves

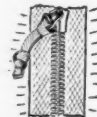
2. Die-cast for smoother action—extra strength



3. Provides opening wherever you want it



4. Won't lock open



5. Resists corrosion

Member of the J. & P. Coats • Clark's **ONT** Family



Here's why you can afford to pay a little more for HYCAR

THERE is no other group of synthetic rubbers exactly like Hycar. Because of this, direct price comparisons of initial raw material costs are misleading.

Hycar, being a superior product, naturally commands a premium price. Yet by the time compounding and processing economies inherent in Hycar are considered, this premium material gives you more for your money than less desirable synthetic rubbers. And higher quality products that in turn command a premium price are the result.

There are many other oil-resistant rubbers. But take a look at some of Hycar's additional advantages:

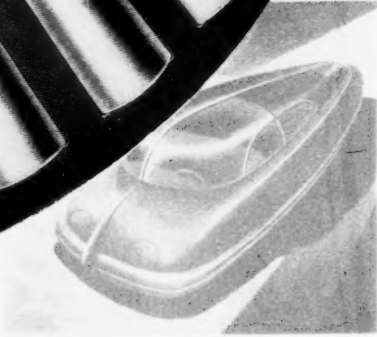
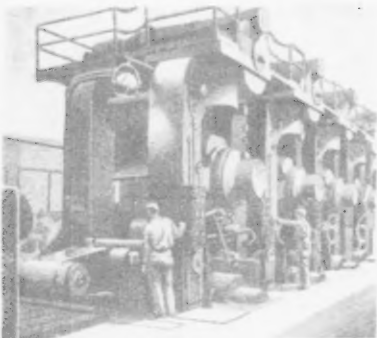
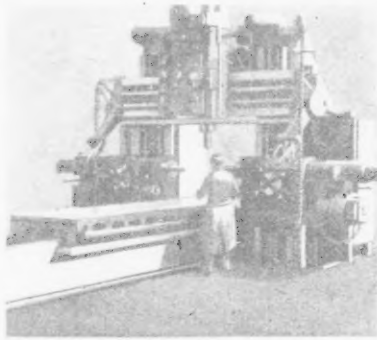
- . . . *Better storage stability in crude and compounded states—won't set up—no stickiness*
- . . . *Dependable uniformity of crude material which eliminates processing changes and compound revisions*
- . . . *Lower specific gravity means 25% more volume in finished product*
- . . . *Better oil and gas resistance*
- . . . *Can be blended with GR-S and maintain adequate oil resisting characteristics*
- . . . *Will take higher pigment loadings without undue sacrifice of quality*
- . . . *Better extrusion characteristics—maintains shape during processing—won't collapse*
- . . . *A variety of combinations of properties not otherwise obtainable*
- . . . *Excellent performance in severest types of service has been proved throughout all industry*

Hycar's Technical Service Staff is at your service, ready to help you with your individual problems. Hycar Chemical Company, Akron 8, Ohio.

Hycar

Reg. U. S. Pat. Off.LARGEST PRIVATE PRODUCER OF BUTADIENE TYPE

Synthetic Rubber



Leadership Throughout Industry

In every branch of Industry, executives see that machinery they use or make is Timken Bearing Equipped.

This practice has become so standard that in numerous cases it is just a routine matter. When bearings are needed, Timken Tapered Roller Bearings are specified.

Management knows the matchless record of this product—ac-

cepted everywhere as the bearing that delivers sustained, dependable performance. Timken Bearings are used in countless types of war material, automobiles, trucks, tractors, locomotives, streamlined trains and industrial machinery generally.

Design, research and experience are the reasons you can trust Timken Roller Bearings no matter how rough and rugged the going.

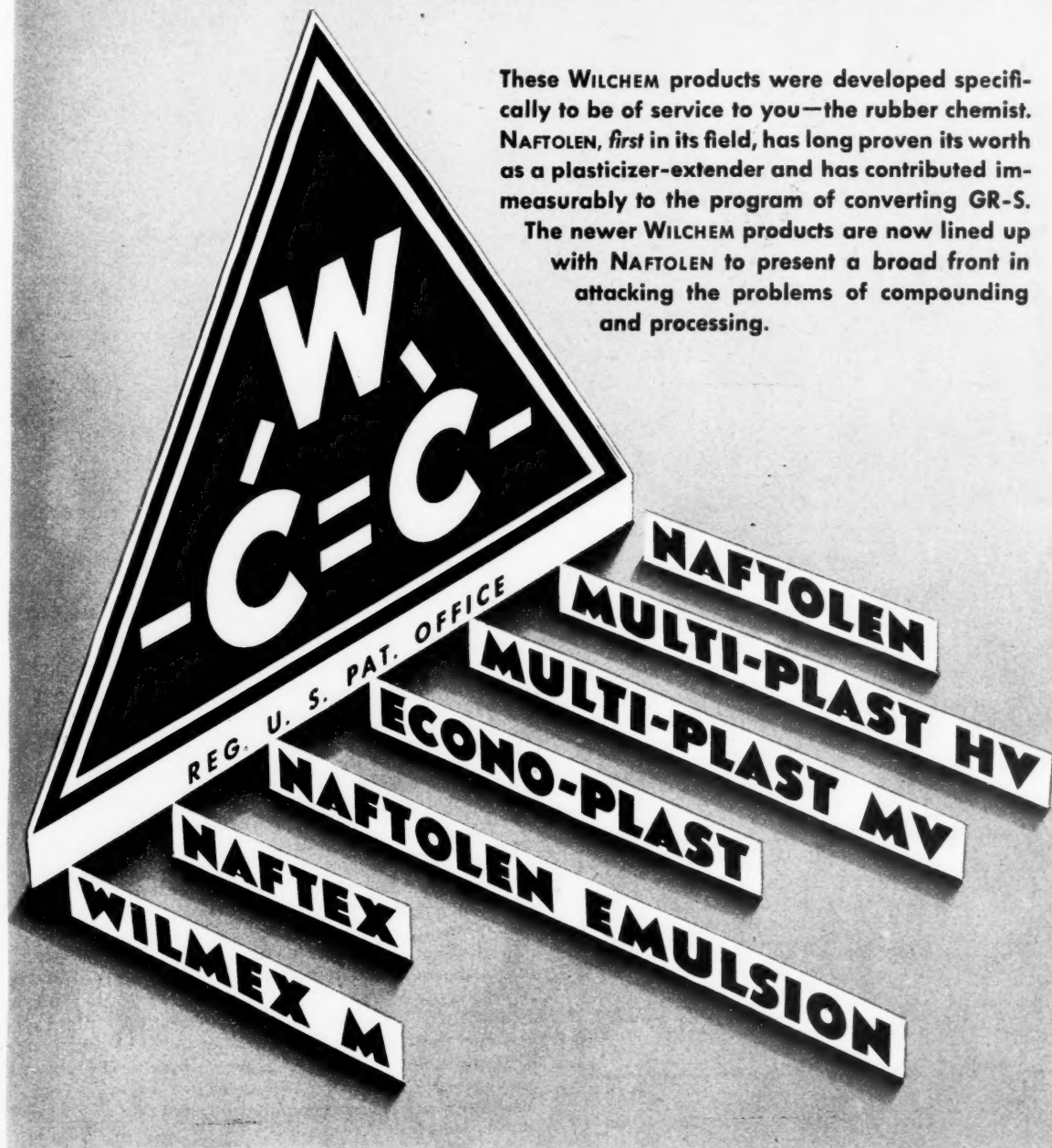
Your choice of bearings must be selective because the life and operating efficiency of any machine are vitally influenced by the quality of its bearing equipment. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
TRADE MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

WILCHEM PRODUCTS

lined up for service on the "rubber front"

These WILCHEM products were developed specifically to be of service to you—the rubber chemist. NAFTOLEN, first in its field, has long proven its worth as a plasticizer-extender and has contributed immeasurably to the program of converting GR-S. The newer WILCHEM products are now lined up with NAFTOLEN to present a broad front in attacking the problems of compounding and processing.



WILMINGTON

CHEMICAL CORPORATION

10 EAST 40TH STREET • NEW YORK 16, N. Y.

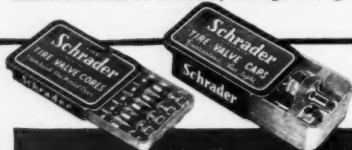


All Standard Schrader Valve Caps in use today contain the specially designed sealing unit with a dome-shaped rubber washer vulcanized between two dome-shaped BRASS plates. Because of their unique construction, these caps are guaranteed airtight up to 250 lbs. pressure. This mighty midget does the work.

MR. & MRS. AMERICA

How to help save your tires. Make it a habit to:

1. Check the tightness of your valve cap each time after you inflate your tires to effect a 100% seal.
2. While you have the cap off (to gauge or add air) look inside it to see if the washer is worn out.
3. If you have no cap or the washer is worn out, replace it as soon as possible with a Standard Cap to be sure that underinflation cannot be caused by leakage through the valve.



Schrader
REG. U.S. PAT. OFF.
CONTROLS THE AIR

CAPS are vital for TIRE CONSERVATION

THIS?

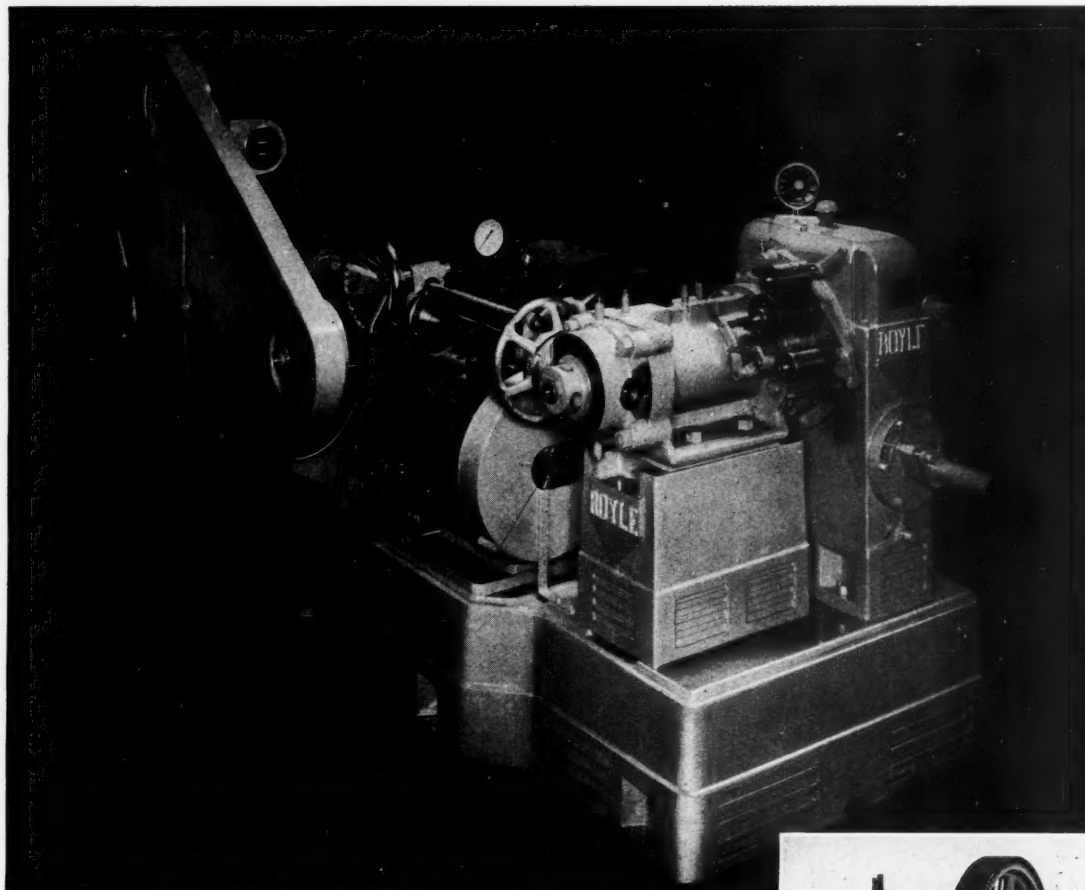
You wouldn't use a water buffalo if your tires gave out? Naturally not—but what would you use if you couldn't get the new tires you need? Since new tires for most of us are still a thing of the future, the situation is very serious.

What to do about it? Take care of your present tires—that's just good sense. How? Keep them properly inflated at all times—for underinflation is the greatest single cause of ruined tires, excessive wear, poor mileage and damage to side walls.

Combating underinflation is easy. Gauge pressure regularly. Put air in tires when needed. Seal the valve with a Schrader Cap.

With the armed forces, the care of tires is a vital issue. No pneumatic tire equipped military vehicle passes inspection without a Standard Cap on all tire valves for everybody knows their importance. Screwed down fingertight, a Schrader Cap makes an airtight seal up to 250 lbs. pressure.

Be sure a Standard Cap is on every tire valve. Take care of those you have—don't lose them by leaving them on loosely. If your dealer is temporarily out of Schrader Caps, don't blame him. Try again later.



No. 2 Royle Continuous Vulcanizing Machine equipped with Stock Screw Speed Tachometer and Sperry Exactor Control.

Built for Years of Service

Recently we received an inquiry from a customer who wanted to know if certain alterations could be made to one of their tubing machines. A check of our records revealed that the machine in question was delivered over fifty-one years ago—July, 1893.

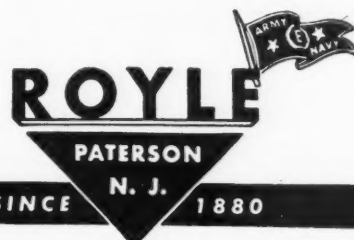
It is encouraging to know that in these days of "use it up, wear it out, make it do" there are Royle oldtimers still capable of doing their bit on the 'production front'.

Today, as always, our skills are devoted to designing and building continuous extrusion machines to meet the specific requirements of the application involved. The 'know how' acquired over the years is built into Royle equipment—reflected in performance records.



An Early No. 2 Royle "Tuber"

JOHN ROYLE & SONS



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James Day (Machinery) Ltd.
London, England

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Sherwood 2-8262

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J. C. Clinefelter
University 3726

PATERSON 3, NEW JERSEY



Solve many GR:S problems

These Columbia pigments have proved of value in products requiring special qualities in GR:S stocks. Here are just a few examples:

Wire Insulation . . .

Problem—to produce GR:S stocks having the necessary tensile strength.

Answer—Calcene T, readily dispersible in GR:S, confers tensile strength meeting specifications for many wire insulation stocks.

No-Mark Soles and Heels . . .

Problem—to provide GR:S soles and heels which will not mark floors.

Answer—Silene EF and Calcene T make a highly satisfactory no-mark sole and heel stock.

Inner Tubes . . .

Problem—to improve retention of elongation and minimize box cracking in GR:S.

Answer—Silene EF in GR:S confers these qualities, resulting in greatly improved inner tubes.

These uses may suggest possibilities for either or both Calcene T and Silene EF in GR:S stocks for your products. We shall be glad to furnish information at your request.



PITTSBURGH PLATE GLASS COMPANY
COLUMBIA CHEMICAL DIVISION

GRANT BUILDING • PITTSBURGH 19, PA.

CHICAGO • BOSTON • ST. LOUIS • PITTSBURGH • NEW YORK • CINCINNATI
 CLEVELAND • PHILADELPHIA • MINNEAPOLIS • CHARLOTTE



RIVER TRANSPORTATION of Chlorine has received strong impetus as the result of a new barge designed and perfected by Columbia. Cradling four huge tanks in its 135 foot length, the barge transported 380 tons of Liquid Chlorine on its maiden voyage in September from Natrium to Charleston, W. Va. Formerly, all river shipments had been limited to one-ton containers—a slow and tedious handling method in comparison with the new barge. This is the latest of numerous improvements in the transportation of Chlorine and other chemicals introduced by Columbia.



BATTLES have been lost for the lack of pure drinking water . . . and Calcium Hypochlorite is playing an important part in safeguarding our armies' water supplies. One of the principal methods used at the fronts is the Lyster bag. Filled with locally obtained water, enough hypochlorite capsules are added to produce a safe chlorine residual. To the civilian the taste might be repulsive, but to the thirsty, battle-weary soldier it's nectar!



COLUMBIA RESEARCH—Though they have not been glamorized, the activities of Columbia's Research Laboratories have contributed much to the nation's war effort. Synthetic, natural and reclaimed rubber, textiles, plastics for aircraft, water purification and chemicals for other military uses—these are but a few of the important fields in which this research has played a vital role. And it will have an equally important part in serving the world's needs when peace has been restored.



NO INHIBITORS are required in Columbia's thermosetting plastic, Allymer, to prevent polymerization while in storage. Allymer may be stored under ordinary conditions for several months without appreciable change. This stability eliminates the distillation or washing processes necessary for removal of inhibitors used in older monomers, and facilitates mass shipment and storage. Data and reports of extensive research on Allymer may be obtained on request.



COLUMBIA CHEMICALS include Soda Ash, Caustic Soda, Sodium Bicarbonate, Liquid Chlorine, Silene EF (Hydrated Calcium Silicate), Calcium Chloride, Soda Briquettes, Modified Sodas, Caustic Ash, Phosflake, Calcene T (Precipitated Calcium Carbonate) and Calcium Hypochlorite.



**— brings a better postwar
gasoline hose from warplanes**

• Proven best for warplane bullet-sealing fuel hose, Chemigum will make superior postwar gasoline hose — with better resistance to aromatic gasoline, with more flexibility at low temperature, and with longer life.

This is only one of many synthetic rubber lessons taught by war. Chemigum — the oil resisting synthetic with superior processing qualities — will find many other postwar uses. For it can be compounded to meet prime physical requirements in practically every application where a rubber-like material is needed but where natural rubber has limitations.

Right now Chemigum is available to manufacturers only on an approved allocation from the War Production Board, accompanied by a formal order. However, Goodyear is permitted to supply individual customers, without allocation, up to 200 pounds per month for experimental purposes.

Tell us the characteristics you most desire (see check list below) and Goodyear engineers will recommend the proper Chemigum compound. To order or to obtain further information, write: PLASTICS AND CHEMICALS DIVISION, SALES DEPARTMENT, Goodyear, Akron 16, Ohio — or 600 West 58th Street, New York 19, N. Y.

GOOD YEAR

THE GREATEST NAME IN RUBBER



CHEMIGUM COMPOUNDS CAN BE SUPPLIED WHICH ARE:

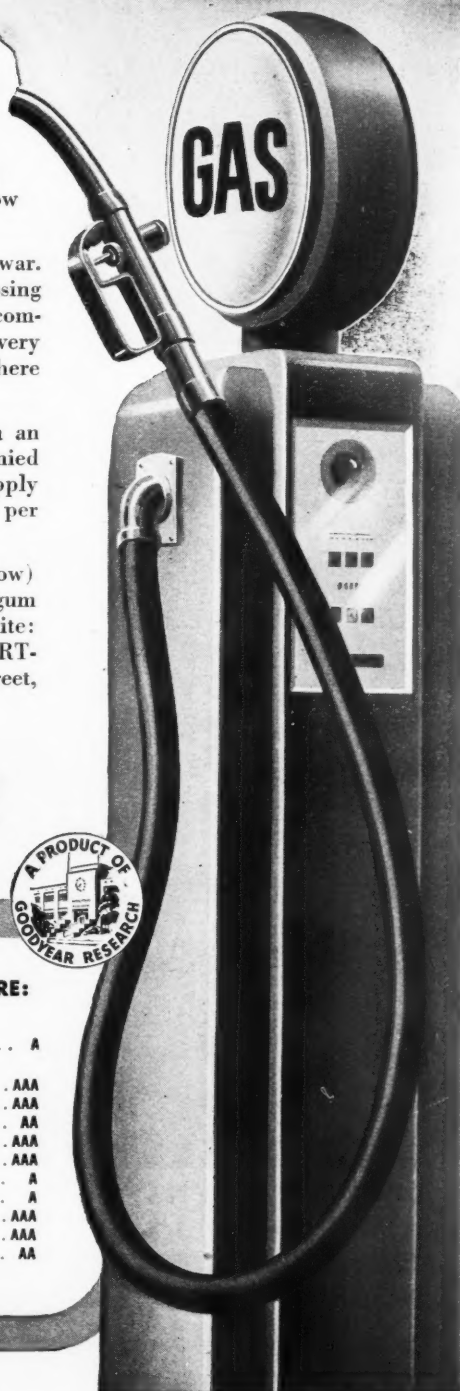
KEY

Satisfactory for most uses	A
Comparable with rubber	AA
Better than rubber	AAA
ELONGATION	AA
HARDNESS	AA
TENSILE	AA
COMPRESSION SET	A
ABRASION	AA
AGING SUNLIGHT	AA
HIGH TEMPERATURE PERFORMANCE	A
LOW TEMPERATURE PERFORMANCE	AAA
TEAR RESISTANCE	AA

ELASTICITY, RESILIENCE	A
SWELLING RESISTANCE—	
MINERAL OIL	AAA
GASOLINE	AAA
WATER 70° F	AA
ETHYLENE GLYCOL	AAA
VEGETABLE OIL	AAA
ACIDS	A
ALKALIS	A
ANIMAL OILS	AAA
FLAME RESISTANCE	AAA
ADHESION TO METALS	AA

Chemigum (pronounced Kem-e-gum)—T. M. The Goodyear Tire & Rubber Company

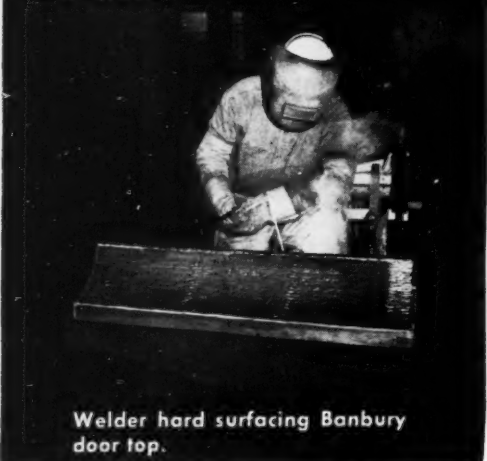
BUY WAR BONDS ★ BUY FOR KEEPS



Here is another reason why
FARREL-BIRMINGHAM
should handle your
BANBURY REPAIRS



Applying hard surfacing material to rotor collars.



Welder hard surfacing Banbury door top.

If rotors are too badly worn . . . if metallurgical tests indicate welding inadvisable for lasting repair of insides of chamber bodies . . . or if dust stop rings, end-thrust adjustment, connecting gears, etc., need replacing — *you must have new parts*. And what's more, in most cases these parts must be identical with the parts used in new machines.

We can furnish these . . . usually from stock. As developer and manufacturer of the Banbury Mixer we know *why* each part is made the way it is, and we have the *necessary* drawings to *duplicate* any original part of the machine. This is important if the machine is to be returned to original efficiency.

However, this is not the only way in which you benefit when you ask us to handle your repairs. Our many years of experience in overhauling, repairing and rebuilding worn Banburys have taught us many ways of "saving" badly worn parts. This means that parts are replaced only when absolutely necessary.

Take the short road to satisfaction



Racks and racks of new rotors, ready for use.

For better Banbury repairs, call the Farrel-Birmingham service man in your territory.



In the East, call—
WALTER D. TAYLOR
Farrel-Birmingham Company, Inc.
Ansonia, Conn.
ANSONIA 3600



Around Akron, call—
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Farrel-Birmingham Company, Inc.
2710 First Central Tower, Akron 8, Ohio
JEFFERSON 3149

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.

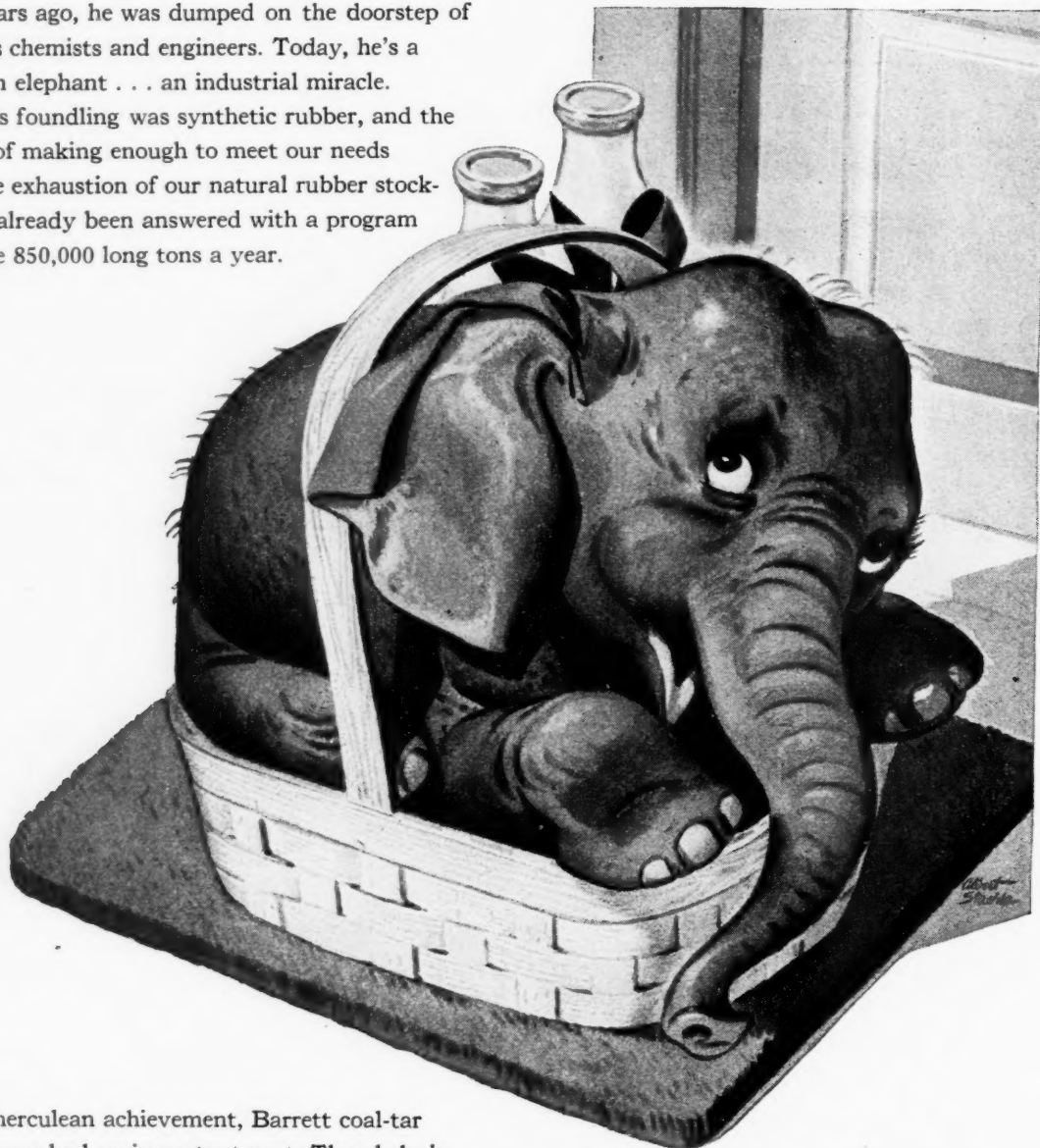
Sales Offices: Ansonia, Buffalo, New York, Pittsburgh, Akron, Los Angeles

call Farrel-Birmingham

America's Baby No. 1

Three years ago, he was dumped on the doorstep of America's chemists and engineers. Today, he's a full-grown elephant . . . an industrial miracle.

For this foundling was synthetic rubber, and the problem of making enough to meet our needs before the exhaustion of our natural rubber stock-piles has already been answered with a program to provide 850,000 long tons a year.



In this herculean achievement, Barrett coal-tar products have had an important part. They help in the processing of every type of rubber—synthetic, natural and reclaim—making it more usable and imparting to it a wide variety of desirable characteristics.

The Barrett Division maintains a complete, fully equipped and fully staffed Rubber Research Laboratory, and the services of Barrett chemists and engineers are available to you in adapting Barrett Coal-tar Chemicals to your requirements. Your inquiries will receive prompt attention.

Barrett Rubber Compounding Materials—Carbonex* • Carbonex S • Carbonex S Plastic • Cumar* • Bardol* • Bardol B • Dispersing Oil No. 10 • Dispersing Oil No. 64 • B.R.H.* No. 2 • B.R.T.* No. 3 • B.R.T. No. 7 • B.R.V.* • S.R.O.* • Reclaiming Oil No. 1621 • B.R.C.* No. 20 • Resin-C* Pitch.

*Trade-mark Reg. U. S. Pat. Off.

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.



ONE OF AMERICA'S GREAT BASIC BUSINESSES

**SERVING
THE TRADE
SINCE 1868**

LOEWENTHAL

**A
N
D** There's a great deal of difference in Scrap Rubber—in the grades and in the quality. Having served the Rubber Reclaiming Industry since its inception, we have the experience, the facilities, and the general "know how" to deliver scrap, expertly sorted and strictly to specification. Our experience is at your service.

RUBBER

THE LOEWENTHAL CO.

JACK SIDER, President

J. K. McELLIGOTT, Exec. Vice-Pres.

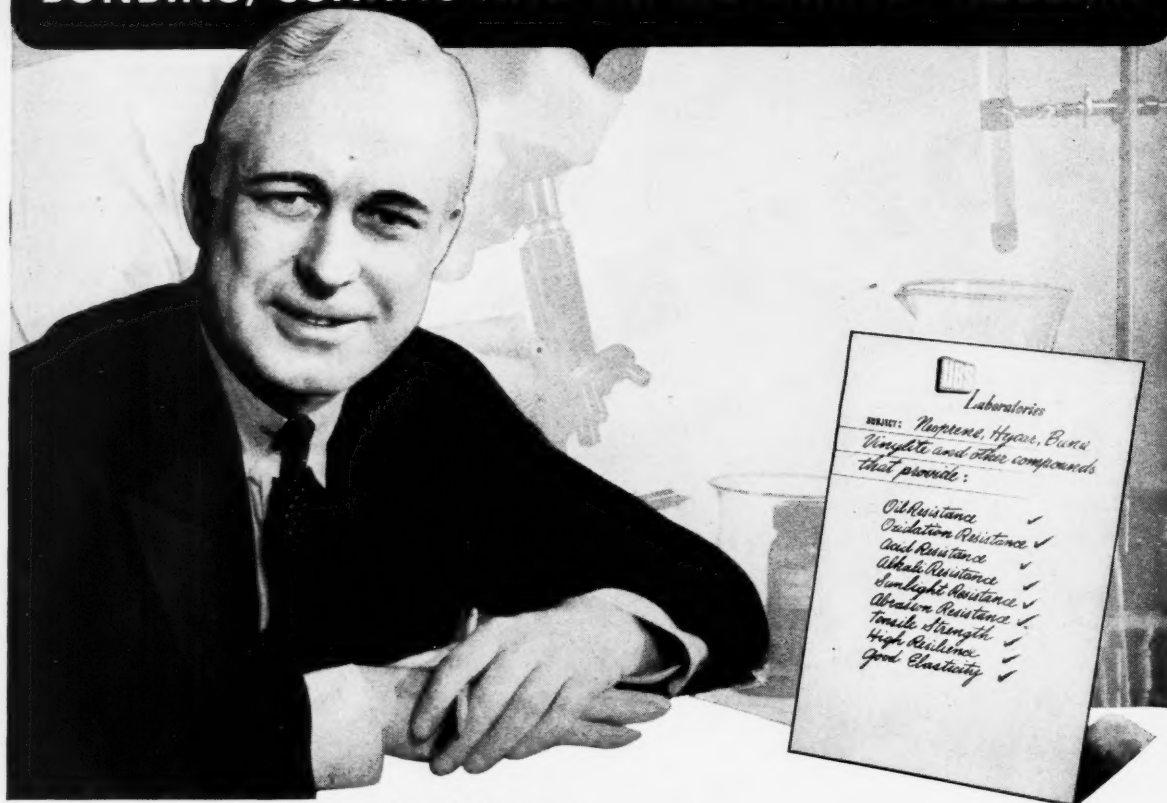
We Solicit Your Inquiries

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CHICAGO 1, ILL.

159 CLEWELL STREET
AKRON 5, OHIO

Cable Address: "Gyblowell"

Consult THE UBS LABORATORIES ON POST-WAR BONDING, COATING AND IMPREGNATING PROBLEMS



No matter what the problem may be — bonding neoprene, rubber and other coated or moulded parts to any ferrous or non-ferrous metal; corrosion proofing chemical tanks and equipment; laminating leather belting; coating magneto parts; combining or coating fabrics; impregnating paper; cementing various materials together; insulating wire and other articles; etc. — you will find the UBS Laboratories equipped to provide (or develop) a formula that will fill your needs. Long-

time specialists in the field of industrial Bonding, Coating and Impregnating Compounds, the UBS Laboratories not only know thoroughly the compounding advantages and limitations of all the latest synthetics, but even have developed an original synthetic latex and synthetic rubber of their own. Write today, describing your Bonding, Coating, or Impregnating Problems.



UBS developed adhesives are being used in the manufacture of inflatable Army and Navy Equipment, where weather and chemical resistant seams of high tensile strength are required.

UBS developed compounds are being successfully used to coat magneto parts and for cementing gaskets, where oil resistance is of great importance.



UBS developed adhesives and coating compounds are being widely used on Army delousing bags, protective clothing, etc., where acid resistance and flame resistance are of paramount importance.

UBS developed compounds are being used for chemical tank linings and to corrosion proof chemical handling equipment, where acid resistance and alkali resistance are primary factors.



Address all inquiries to the Union Bay State Chemical Company, Rubber Chemicals Division, 50 Harvard Street, Cambridge 42, Massachusetts.



UNION BAY STATE Chemical Company

Serving Industry with Creative Chemistry

ORGANIC CHEMICALS • SYNTHETIC LATEX • SYNTHETIC RUBBER

PLASTICS • INDUSTRIAL ADHESIVES • DISPERSIONS

COATING COMPOUNDS • IMPREGNATING MATERIALS • COMBINING CEMENTS



DIXIE 40

This latest furnace-process reinforcing carbon black (HMF type) for synthetic and natural rubber possesses a combination of most desirable characteristics—

- cool mixing
- easy processing
 - smooth and rapid extrusion
 - fast rate of cure
 - full reinforcement
 - low heat build-up
 - high resiliency
 - high resistance to cut growth, flex cracking and abrasion.

Dixie 40 is especially useful for tires of all types, pneumatic or solids, under any conditions; tubes, bogie wheels; footwear; and mechanical goods.

Try a 50-50 blend of Dixie 40 and channel black for tread stock to secure better plasticity. It will make it possible for you to dispense with one milling and thus—which is so important now—**INCREASE YOUR OUTPUT.**

RESEARCH DIVISION

UNITED CARBON COMPANY, INC.

Charleston, West Virginia

SEND TO

HARDESTY CHEMICAL COMPANY

for samples of these

PLASTICIZERS

SAMPLES of Hardesty Chemical Company's plasticizers will convince you that their consistent high quality can help you achieve peak production. Hardesty Chemical Company is now in production on these plasticizers and invites your study of these products which are now available.

SEBACIC ACID

Specific gravity	1.085 25/15°C
Melting point	128°C
Neutralization equivalent	102
Free fatty acid	98.5%
Moisture	0.15%
Mol. weight	202.14

BUTYL ROLEATE

Free fatty acid	2%
Butanol	0.2%
Moisture	0.2%
Color	Red

DIBUTYL SEBACATE

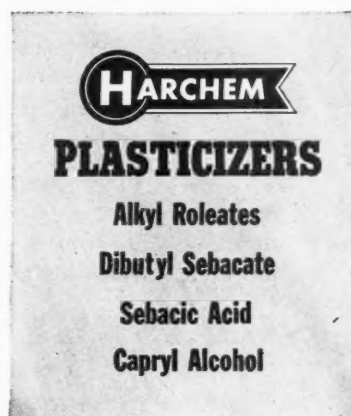
Purity	98.5% Minimum
Specific gravity	0.935 20/20°C
Acidity as Sebacic	0.3% Maximum
Color	15Y, 3.5R
Butanol	0.1% Maximum
Flash point	380°F
Boiling point	344°C. @ 760 mm. 175-180°C @ 3 mm.

Water solubility	Less than 1% @ 25°C
Freezing point	11°F
Weight per gallon	7.8 lbs.
Index of refraction	1.4391 @ 25°C
Dielectric constant	3.6
Power factor—60 cycles	6

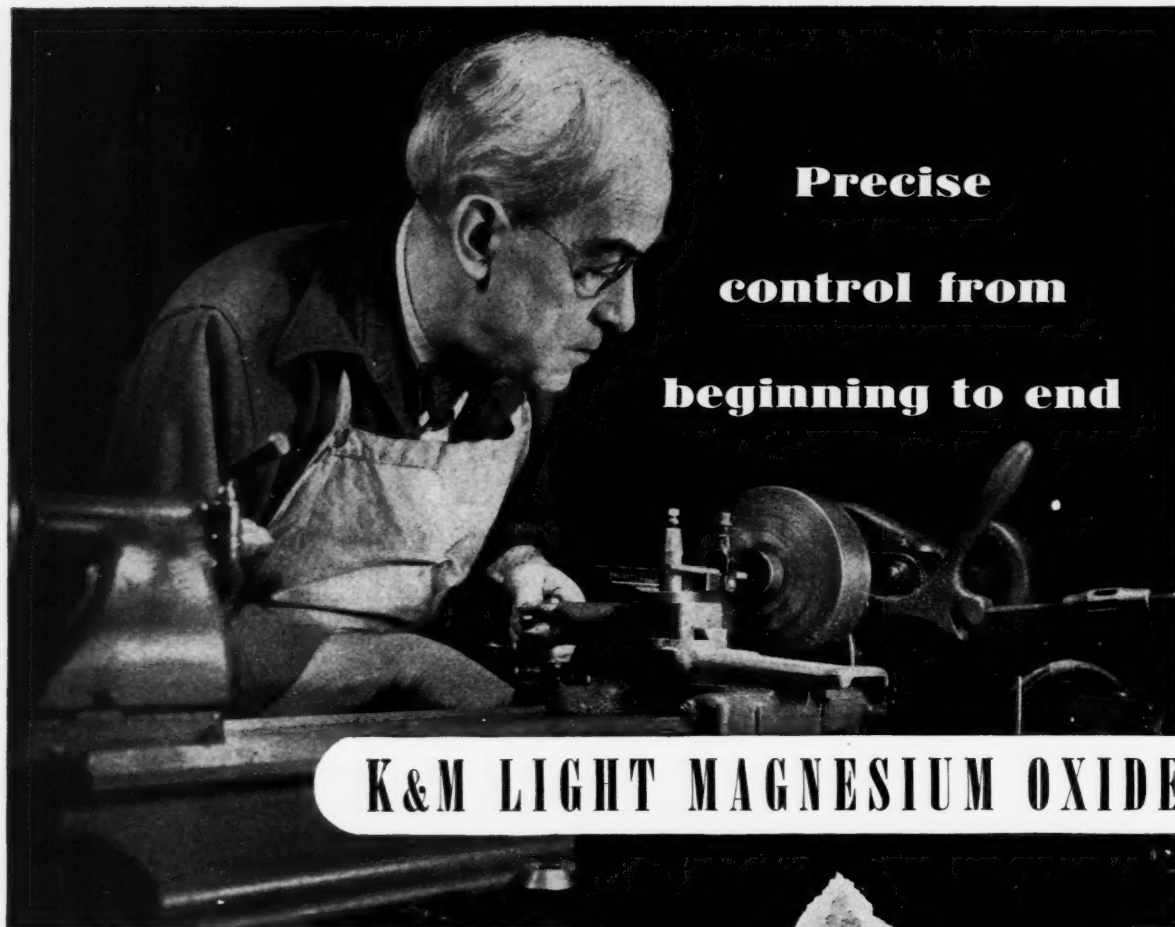
CAPRYL ALCOHOL

Specific gravity	0.815/20°C
Mol. weight	130.23
Flash point	172°F
Distillation range	176.8/179.9°C
Refractive index	1.4266 @ 20°C
Lbs. per U.S. gallon	6.81
Boiling point	178/179°C
Moisture	0.25%

Send for samples and additional information



HARDESTY CHEMICAL COMPANY, INC., 41 EAST FORTY-SECOND STREET, NEW YORK 17, N.Y.



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Complete and careful manufacturing control from the raw material to the finished product. This is the way that K&M provides Neoprene Compounds with Light Magnesium Oxide of uniform lightness and unvarying quality. That's why there are so many repeat demands for K&M Light Magnesium Oxide.

To answer these demands, Keasbey & Mattison have expanded their facilities for producing Light Magnesium Oxide. Now more of this essential compounding material is available than ever before.

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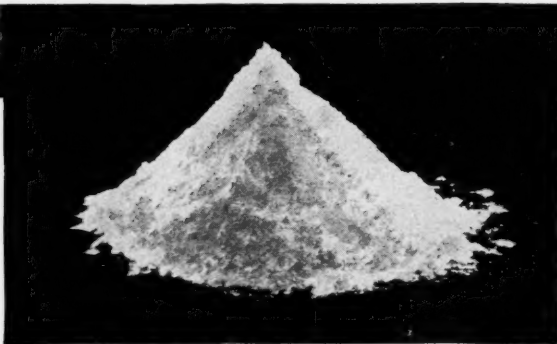
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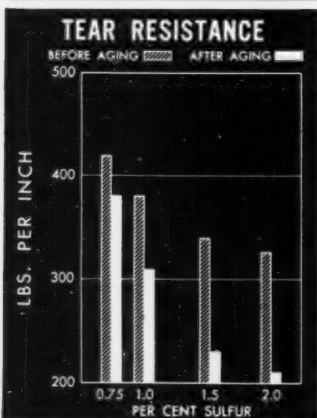
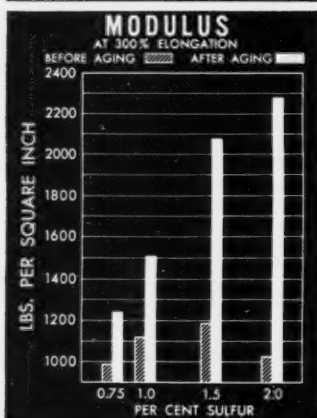
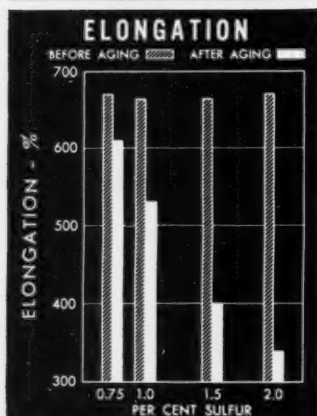
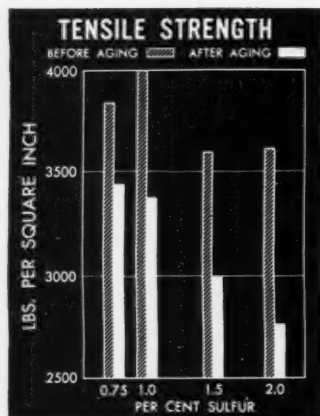
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**Plasticizer and Extender for GR—S
Chemically and physically Controlled**



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Give your GR-S Compounds heat stability provided by low sulfur content

Safe, fast curing now made possible by FBS LITHARGE

As you know, reduction in sulfur content means increase in heat stability.

It has now been demonstrated that FBS litharge (plus benzothiazyl disulfide) makes low sulfur formulas practicable.

Why?

Because it speeds up greatly the

rate of cure without increasing the risk of scorching.

Thus, even though the normal quantity of accelerator is used, *the sulfur content can be reduced.*

Note, in the series of tests charted and tabulated, the superior behavior of the 0.75 and 1.0 sulfur formulas.

FORMULA

GR-S (Institute).....	100
E.P.C. Carbon Black.....	50
Zinc Oxide.....	3
Coal tar softener.....	5
Benzothiazyl Disulfide.....	1.0
FBS Litharge.....	1.5
Sulfur	variable

Effect of Varying Amounts of Sulfur on Physical Properties

(Curing period: 20 min. Temp: 287° F.)

% Sulfur	Tensile Strength	% Elongation	Modulus at 300% Elong.	Tear Resistance
0.75	3840	670	980	420
1.0	4000	665	1120	380
1.5	3600	665	1190	340
2.0	3620	670	1025	325

After Aging 24 Hours at 100° C.

0.75	3460	610	1240	380
1.0	3380	530	1510	310
1.5	3000	400	2080	230
2.0	2770	340	2280	210

CONCLUSIONS:

1. FBS Litharge-thiazole with low sulfur imparts heat stability.
2. Modulus is high and steady.
3. Elongation is retained despite exposure to heat.
4. Heat stability prevents brittleness and improves tear resistance.
5. Rate of cure is relatively fast, without tendency to scorch.
6. The combination is inexpensive and efficient.



Ask us to send you a printed report, "Compounding of GR-S for Heat Resistance," issued by the Rubber Division of our Research Laboratories, which covers the subject of FBS Litharge for low sulfur formulae in greater detail and from a number of additional angles.

NATIONAL LEAD COMPANY

New York, Buffalo, Chicago, Cincinnati, Cleveland, St. Louis, San Francisco; Boston /National-Boston Lead Co.; Pittsburgh (National Lead & Oil Co. of Penna.); Philadelphia (John T. Lewis & Bros. Co.).

A combination that's become a

Lasting Friendship



LASTING is exactly the word for it. For the combination of wire and rubber has brought about greater *lasting* qualities for tires, V-belts, flat conveyor belts, hose, and scores of other rubber products.

Yes, wire reinforcement of rubber eliminates stretching, increases tensile strength, elasticity, and rigidity—makes rubber better able to do the important jobs in store for it.

That's why we at National-Standard are devoting so large a part of our time and resources to developing better wire and meth-

ods of application for every conceivable wire-and-rubber combination—wire that meets not only the specifications of today, but presents to both the rubber industry and ourselves, *new product possibilities for tomorrow.*

So, if you have a problem along that line, perhaps our experience and research facilities can be of help . . . and it *may* lead to a *lasting* friendship.

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- ★ **ADVAN**—New delayed action accelerator recommended for GR-S for footwear, hose covers, CV insulation, etc.
- ★ **ADVAGUM**—Synthetic thermoplastic used to assist processing of Buna N type synthetics.
- ★ **ADVAWET**—Series of powerful wetting out and emulsifying agents. Also suitable for stabilizing synthetic latices and dispersions.
- ★ **COPPER NAPHTHENATE**—Powerful mildewproofing agent. Meets all Armed Forces specifications.
- ★ **EXTENDER 15**—Extender for dibutyl phthalate and other plasticizers. Readily available.
- ★ **OROPLAST**—Extender and softener with outstanding smoothening quality when used with GR-S compounds for calendering, tubing and skim coating.
- ★ **PLASTOFLEX**—Series of efficient plasticizers for vinyl chloride resins. Good low temperature flexibility.
- ★ **PLASTOFLEX 10**—Replacement for dibutyl phthalate in Buna N type synthetics. Gives high resilience.
- ★ **PLASTICIZERS VA**—Plasticizer for vinyl acetate polymers as replacements for latex and for shoe adhesives.
- ★ **PLASTAC**—Tackifier and plasticizer for GR-S.
- ★ **RESIN V**—Tackifier for GR-S, also in adhesive work with GR-S latices.
- ★ **VISTAC**—Series of hydrocarbon polymers being used as tackifiers and processing aids for GR-S, Vistanex Polybutene and other rubbers.
- ★ **VISTANEX POLYBUTENE**—Isobutylene polymers for special purpose GR-S and synthetic insulation compounding. Outstanding for pressure-sensitive adhesive bases.
- ★ **ZINC NAPHTHENATE**—Colorless mildewproofing agent for fabrics such as duck, braid, etc. Meets government specifications.



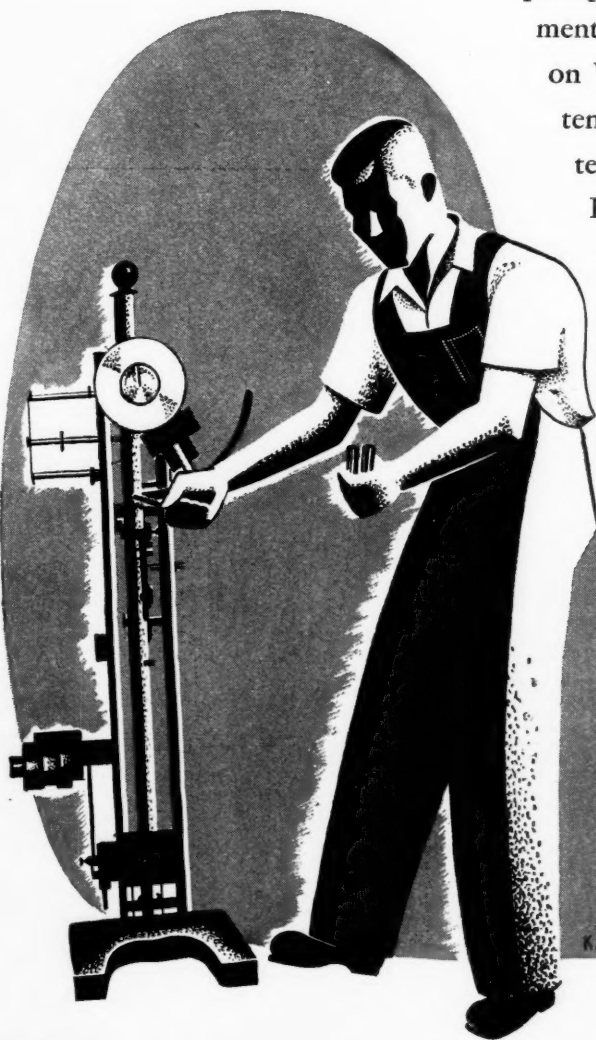
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When your formulations demand a precipitated calcium carbonate pigment of ultra fine particle size—count on Witcarb R. Unexcelled as an extender, where low modulus and high tear resistance are required, Witcarb R imparts a tensile strength—which is more than 100% better than that of other calcium carbonates. Send for a trial sample and confirm its advantages for your applications.

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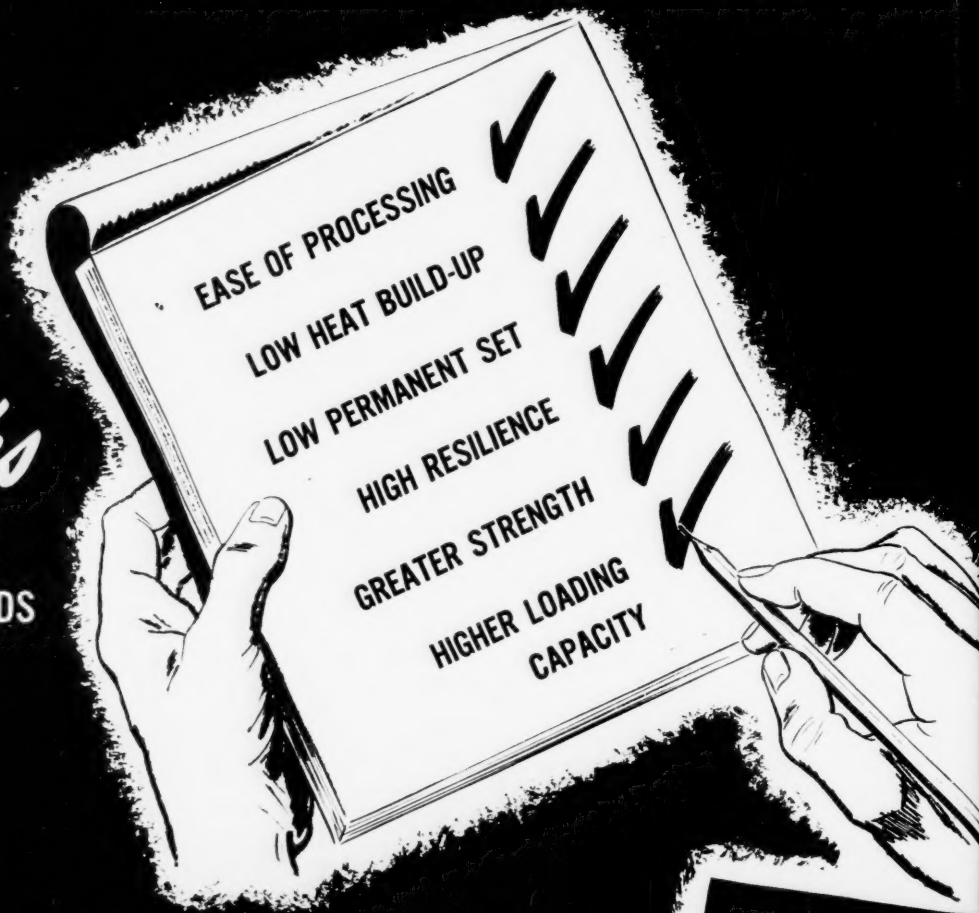
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SEND FOR YOUR COPY of the Continex SRF Technical Bulletin. Prepared by the Witco Research Laboratories, it gives a detailed report on the properties and characteristics of Continex SRF.



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[CONTINENTAL CHANNEL AND FURNACE BLACKS]



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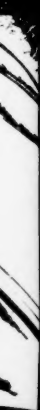
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Double Trouble!

Oh, what an unbeautiful day *this* is going to be!

And it is an unbeautiful day in your plant, too, when the solvent you are using varies in uniformity. For a solvent is one of many ingredients in a formula. When uniformity varies from one batch to another—there's double trouble.

That, however, is one headache you can easily avoid. Specify SKELLYSOLVE. The SKELLYSOLVE of a given type that you order a year hence will be identical in characteristics with that type ordered today. The reason: uniformity in SKELLYSOLVE is assured by the way we refine it. Each step is directed and checked by scientific, *precision* instruments . . . instruments not subject to human error . . . that do not forget.

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Tensile Strength

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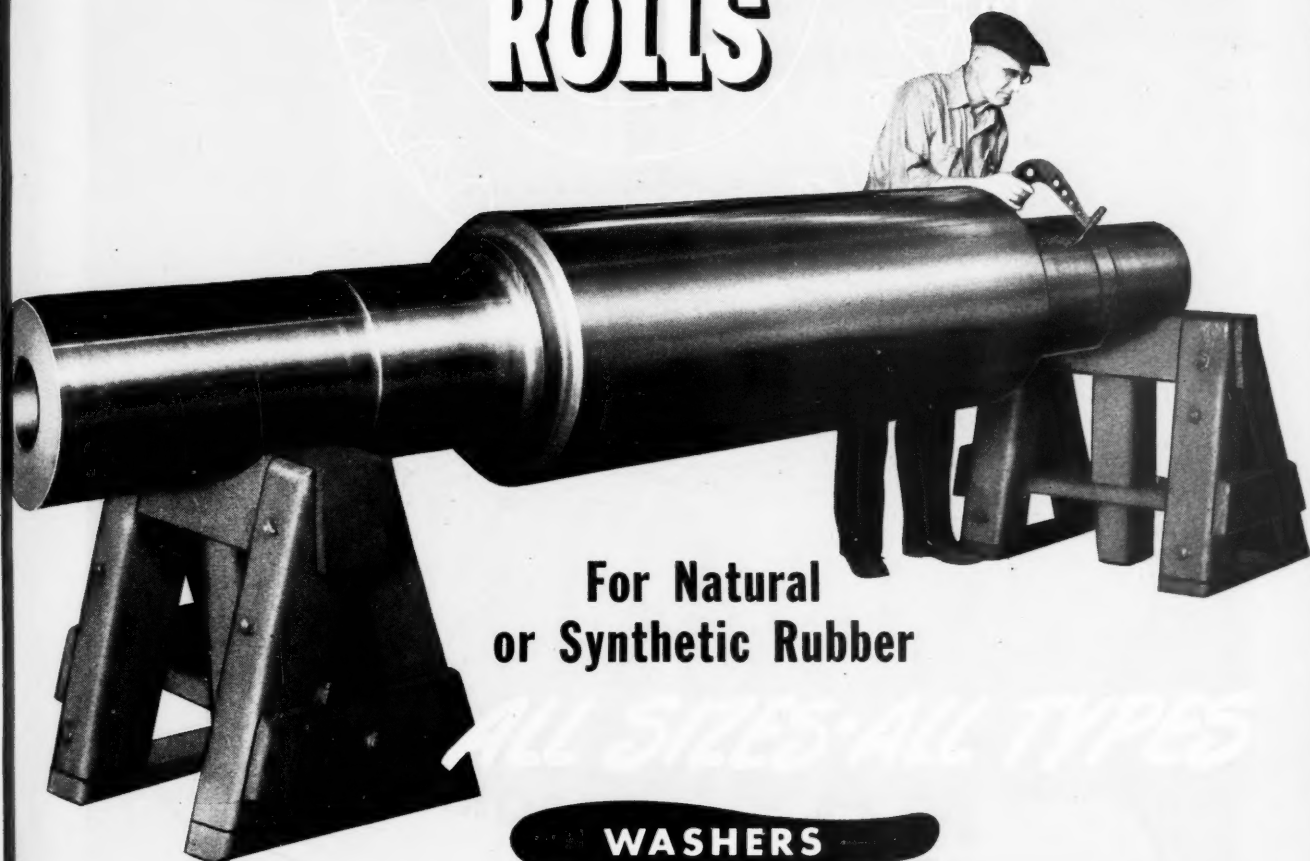
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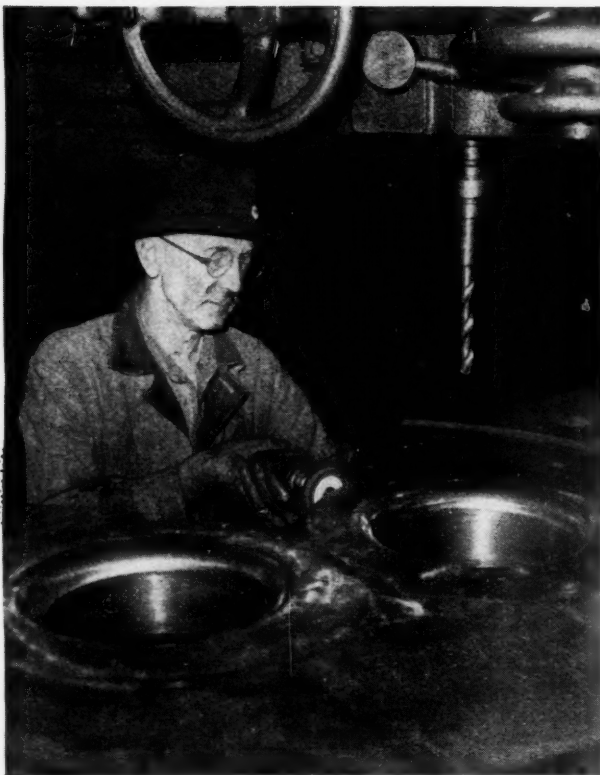
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FLEXOL *Plasticizer* 4GO

A NEW PLASTICIZER *Now in Commercial Production*

This new plasticizer is outstanding because . . .

1. It has extremely low volatility.
2. It imparts superior low-temperature flexibility.
3. It is highly efficient.

Flexol Plasticizer 4GO (Polyethylene Glycol Diethylhexoate) is compatible with vinyl chloride, nitrocellulose, vinyl acetate, and ethyl cellulose resins, and is particularly efficient with vinyl chloride-acetate films.

Other Plasticizers in the Flexol Family

Flexol Plasticizer DOP (Dioctyl phthalate, Diethylhexyl phthalate) is one of the best all-round plasticizers made today, particularly because of its low evaporation rate (1/40th that of dibutyl phthalate). It is highly efficient with neoprene and the vinyl resins, and with nitrocellulose gives a film with as much as 50 per cent higher tensile strength for the same degree of flexibility. It is extremely resistant to water extraction, produces good low-temperature flexibility, and has excellent light and heat stability. Its power factor and dielectric constant are outstanding. Flexol DOP is also used to couple less compatible plasticizers in plastic compositions.

Flexol Plasticizer 3GH (Triethylene glycol diethylbutyrate) is particularly useful in safety-glass films, like those of vinyl butyral resins,

because of its clarity, light stability, and its ability to improve the adhesion of the resins to the glass. Resins plasticized with Flexol 3GH have outstanding low-temperature flexibility.

Flexol Plasticizer 3GO (Triethylene glycol diethylhexoate) is similar to Flexol 3GH but is less volatile. Thus, it is useful in surface coatings and in molded and extruded compositions where greater plasticizer retention is required. Flexol 3GO develops excellent flexibility at low temperatures. It is a useful plasticizer for cellulose acetatebutyrate, vinyl chloride-acetate and vinyl butyral resins, and synthetic rubbers such as Neoprene and Thiokol ST.

For further information write for the new booklet describing the Flexol Plasticizers.

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Unit of Union Carbide and Carbon Corporation

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(SELENIUM DIBUTYL DITHIOCARBAMATE)

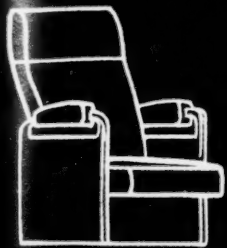
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NOVAC IS A FREE-FLOWING, HIGHLY RUBBER SOLUBLE
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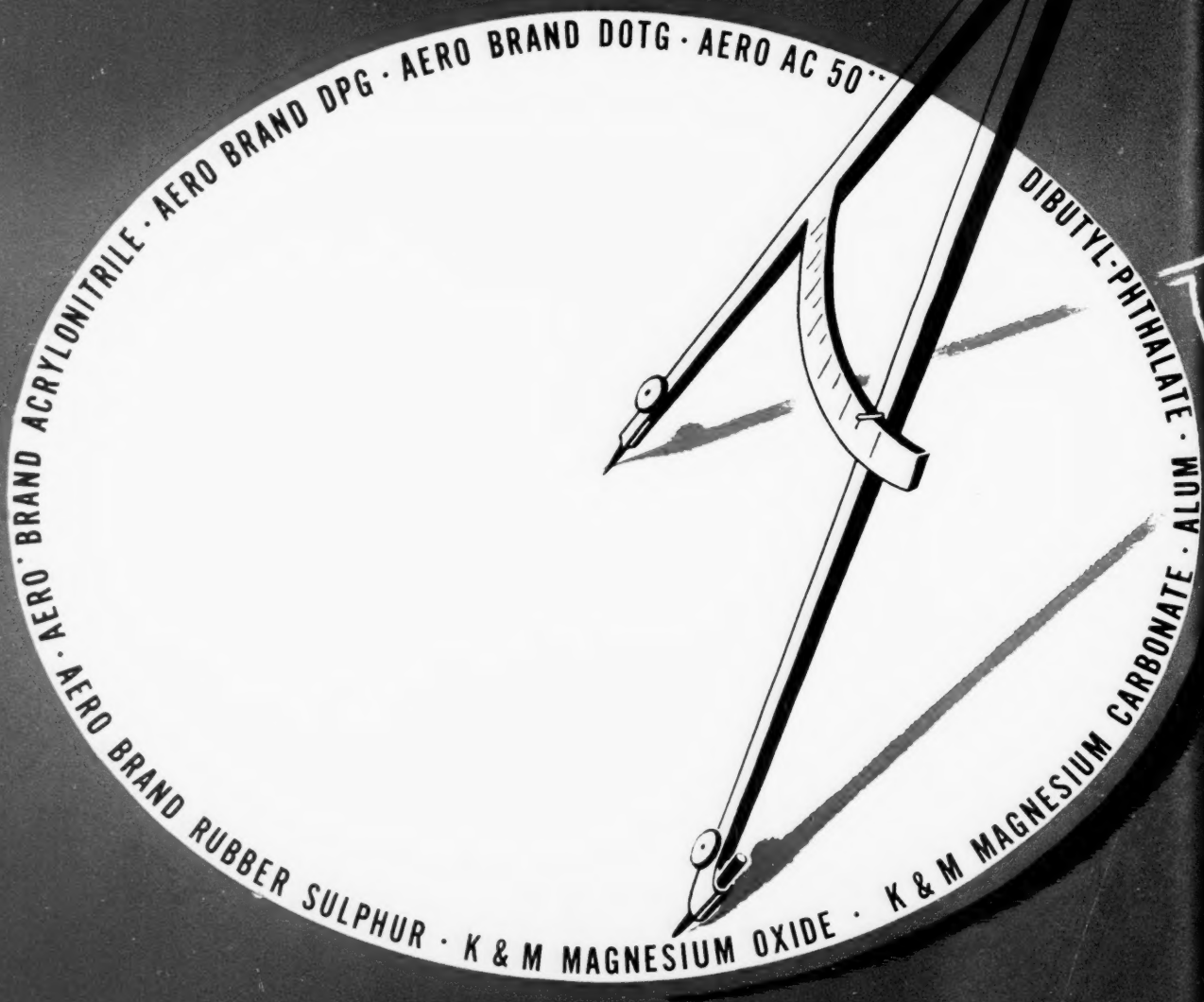
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Cyanamid's "controlled quality" production of chemicals for the rubber industry is the key to the dependability of these materials which is helping to maintain fast and economical processing schedules for the war effort and essential civilian uses. This, coupled with the strategic locations of Cyanamid warehouses, assure quick deliveries of quality chemical supplies to all centers of the rubber industry.

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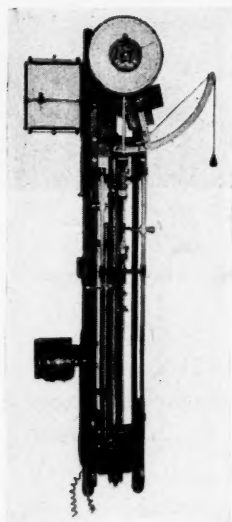
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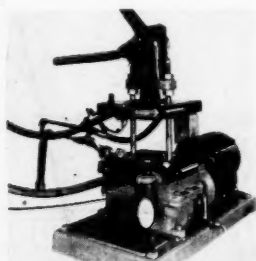
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pays **4** ways!

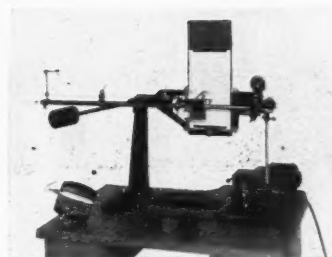


Model L 3. Improved tester for dumb-bell samples with instant return of lower jaw. Capacity up to 500 lbs.



MOONEY PLASTOMETER

This exclusive Incline-plane *Scott Tester is ideal for testing rubber thread, having a capacity of 0 to 2,000 grams. This machine accomplishes tests of extreme sensitivity for tensile and hysteresis.



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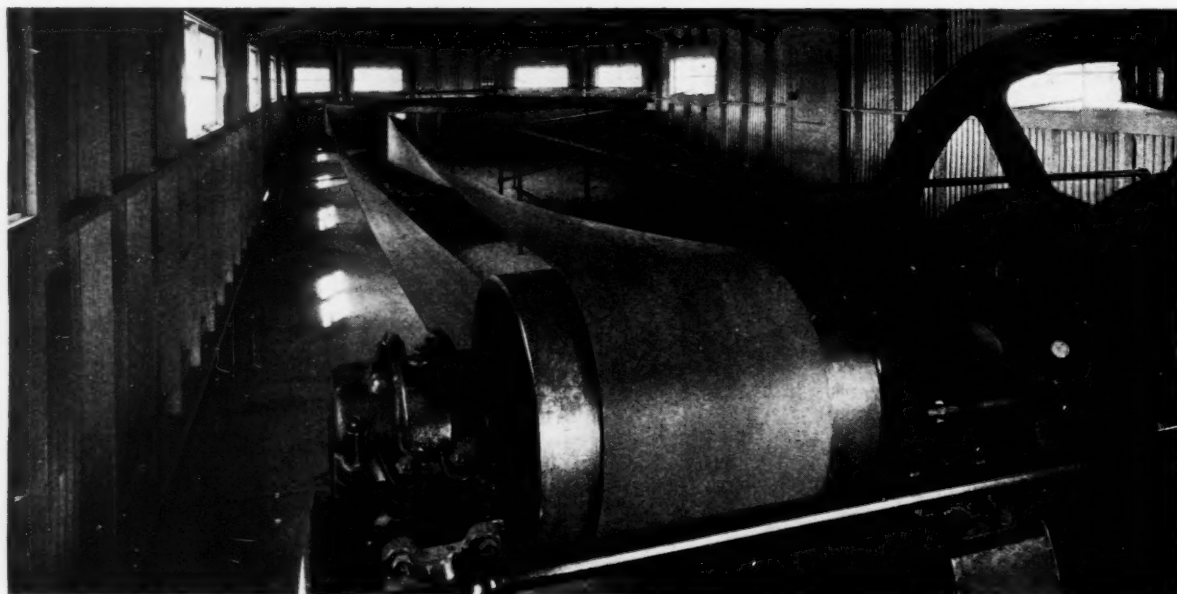
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PELLETEx and GASTEx

On the Home Front, Too



The continuous service demanded of this 20" endless belt causes far more wear than usual. The properties of PELLETEx and GASTEx here serve to lengthen the life of the belt. Compounds heavily loaded with these popular semi-reinforcing furnace blacks show greater flexibility, lower heat build-up, lower permanent set, superior aging, and greater resistance to oil and solvents—

all valuable contributions to belting such as this.

So PELLETEx and GASTEx are helping win the war on thousands of home fronts just as fully as in equipment used on the fighting fronts.

Plan to use PELLETEx and GASTEx after Victory when priorities and allocations are ogres of the past.

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from Research...*



PICCOVOL

— A Coal Tar Type Softener and Plasticizer, developed to meet the specifications of Rubber Reserve Company, for synthetic, reclaimed and natural rubbers . . . *

Among the improved physical properties PICCOVOL gives to GR-S formulations over coal tar softeners are these: —

- (a) Improved tear resistance
- (b) Higher tensile
- (c) Greatly improved elongation
- (d) Improved aging

It is readily available in any quantity.

***Specifications:**

Liquid at 40° F.

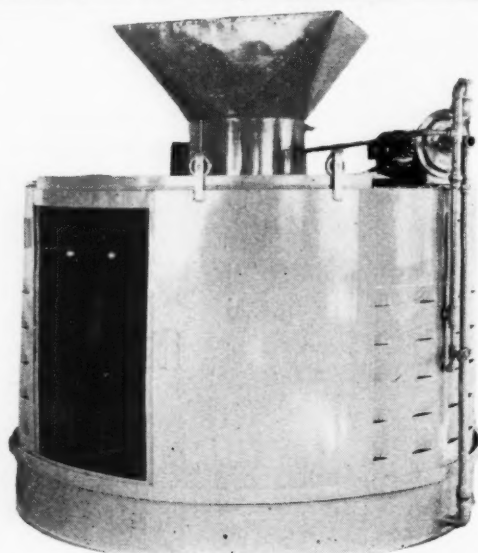
Color: dark

Specific Gravity: 1.09

Flash Point: 111° C.

Manufactured by Pennsylvania Industrial Chemical Corp.

STANDARD  *Chemical Company*
General Offices AKRON 8, OHIO



RUBBER SLAB COOLER

The mill room equipment at the left is used to lubricate cool and dry rubber slabs having been hand cut from a rubber mixing mill.

Do that job for less money, in less floor space with cleanliness around your mills.

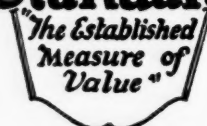
Simple to operate, practically no maintenance or care required.

Set in required location. No anchor bolts necessary. Connect electrical line, water and drain. It is then ready for operation.

FURTHER DETAILS UPON REQUEST

The Akron Standard Mold Co.

Akron



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CRYSTEX INSOLUBLE SULPHUR

Commercial Rubbermakers' Sulphur, Tire Brand, 99½% Pure

Refined Rubbermakers' Sulphur, Tube Brand, 100% Pure

Carbon Tetrachloride, Carbon Bisulphide

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**Technical
Bulletin No. 4**

on the compounding of GR-S with Substantial Loadings of Zinc Oxide

"Trimene Base" Acceleration

"TRIMENE BASE" was one of the first organic accelerators tested in our laboratory to give encouraging results with substantial amounts of Zinc Oxide.

Stress-strain results, both original and aged, are satisfactory and show generally higher values than an equal volume loading of semi-reinforcing black. The pendulum rebound is high for a GR-S compound, and the

heat generation is relatively low.

"Trimene Base" is capable of reacting with free fatty acids and it is probable that this reactivity contributed to the good results obtained with this accelerator. The coumarone-indene resin and E. L. C. Magnesia remain important constituents of Zinc Oxide—GR-S compounds. The selection of the proper grade of magnesia is important in obtaining optimum results.

COMPOUND NO. 4

GR-S	100.0
Sulfur.	4.5
"Trimene Base" . .	1.1
"Cumar MH 2½" . .	5.0
E.L.C. Magnesia . .	7.5
Zinc Oxide	96.0
(Kadox Black Label-15)	

ORIGINAL RESULTS

Time of Cure Min. at 45 Lb.	Tensile Strength Lb./Sq. In.	Per Cent Elongation	Load (Lb./Sq. In.) For Elongation of				Permanent Set
			200%	300%	400%	500%	
7.5	1040	875	125	165	210	290	.44
15	1430	625	210	295	460	755	.43
30	1620	480	355	513	910	...	.40
45	1360	420	370	575	1150	...	.30
60	1250	365	415	705	....	...	.23
90	1290	345	485	850	....	...	.20

Time of Cure Min. at 45 Lb.	Goodyear-Healey Pendulum		Compression Fatigue (Goodrich Flexometer) *				Dynamic Compression	
	Indentation in mm.	Per Cent Rebound	Per Cent Initial Comp.	Running Time and Per Cent Permanent Set	Max. Temp. Rise °C		Initial	Final
90	7.18	65.1	17.3	15'— 1.0	18.7		9.0	9.1

*Test Conditions: 100 Lb. Load. 0.15" Stroke. 100°C. Oven Temp.



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November, 1944

Volume 111

Number 2

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INDIA

RUBBER WORLD

NATURAL & SYNTHETIC

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Published monthly by Bill Brothers Publishing Corp., 1309 Noble St., Philadelphia 23, Pa.
Editorial and Business Offices, 386 Fourth Ave., New York 16, N. Y. Chairman of Board
and Treasurer, Raymond Bill; President and General Manager, Edward Lyman Bill;
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Subscription price—United States and Mexico, \$3.00 per year; all
other countries, \$4.00. Single copies, thirty-five cents. Other Bill
publications are: GROCER-GRAPHIC, PREMIUM PRACTICE,
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NATURAL & SYNTHETIC

Published at Philadelphia, Pa.

Editorial and Business Offices, 386 Fourth Avenue, New York 16, N. Y.

Volume 111

New York, November, 1944

Number 2

The Formation of Vinyl Polymers in Emulsions and in Suspensions—II

THIS is the second in a series of articles which will appear in INDIA RUBBER WORLD during the next few months by H. Mark, W. P. Hohenstein and their coworkers at the Polytechnic Institute of Brooklyn on experiments directed toward determining the mechanism of the polymerization of vinyl derivatives in emulsions and suspensions. The first article, entitled "Polymerization of Vinyl Derivatives in Suspension", appeared in our June, 1944, issue. As indicated in the first presentation, more details on suspension polymerization will be given in another article on this same subject. The subject of this month's communication, "Some Experiments on the Polymerization of Styrene in Emulsion", should be of particular interest since it is treated in a manner that not only reveals the most recent thoughts of many workers in the field, but also provides basic fundamental information for technologists in the rubber and plastics industries who may not be directly concerned with production, but rather with the use of the materials resulting from the industrial polymerization processes. The entire series will include a total of four or possibly five papers. EDITOR'S NOTE.

Recent studies of the peroxide initiated polymerization of styrene have shown that the total reaction consists of a number of elementary processes, such as activation, propagation, transfer, and termination. In a homogeneous system, such as the plain monomer or a solvent in which both the monomer and the polymer are soluble, these individual steps take place uniformly all over the volume in which the reaction proceeds without any geometrical differentiation or preference to any part of the system. If one knows the order and the rate constant (frequency or collision factors A and activation energies E) of each of the four elementary reactions as enumerated above, one has a fair insight into the "mechanism" of such a polymerization process. Although the exact values for these rate constants are not yet definitely established, there exists enough experimental material to indicate

Some Experiments on the Polymerization of Styrene in Emulsion

W. P. Hohenstein,¹
S. Siggia,² and H. Mark¹

at least their order of magnitude. [Compare (1, 2).³]

This invites an attempt to expand experimental and theoretical studies of styrene polymerization to heterogeneous systems such as suspensions and emulsions. Under such conditions it will not suffice any more to know how each individual reaction proceeds, but additional information will be needed as to where it takes place. Only a combined knowledge of the kinetics and location of each elementary process, such as activation, propagation, termination, etc., can provide a satisfactory picture of a heterogeneous polymerization reaction.

In a previous article (3) a few experiments on benzoyl-peroxide-initiated styrene polymerization in suspension were reported, which seem to indicate that this type of heterogeneous reaction is nothing but a water-cooled bulk polymerization of monomers which have been broken up into small globules. All three main elementary steps (activation, propagation, and termination) occur inside the globular particles in much the same way as they do in the liquid monomer phase.⁴ Much more complex is apparently the geometrical location of the various individual steps if the monomer phase is not only broken-up by simple mechanical agitation, but if in addition surface active materials, such as soaps or detergents, are used to produce and maintain an emulsion of small average particle size throughout the reaction. Polymerization in emulsion was observed about 30 years ago (4) and, primarily because of the relatively high rate of polymerization and the efficient heat dissipation through the aqueous medium, has attracted great interest from the industrial point of view. This is manifested by an almost confusing number of patents disclosing and protecting certain experimental procedures and the resulting products. Only very few scientific papers, however,

¹ Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

² J. Matiello industrial research fellow at the Polytechnic Institute of Brooklyn; present address, General Aniline & Film Corp., research laboratory, Easton, Pa. Part of the work reported in this paper was carried out by S. Siggia in 1942 and 1943 and presented as thesis for the degree of Ph.D. at the Polytechnic Institute of Brooklyn in June, 1944.

³ Bibliography references appear at the end of this article.

⁴ This "pearl" or "bead" polymerization may be considered as one limiting case of emulsion polymerization: namely, one with very large dispersed particles and with very little or no dispersing agent.

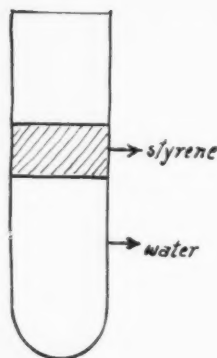
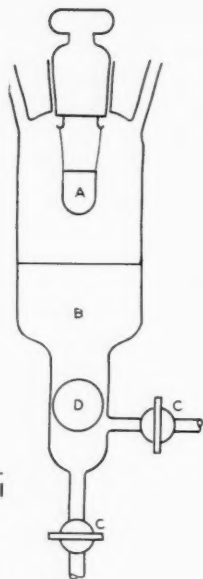


Fig. 1. Monomer-Aqueous Phase System with Interface

Fig. 2. Vapor Phase System without Interfacial Contact

- A. Hydrocarbon phase
- B. Aqueous phase
- C. Stopcocks
- D. Plane parallel glass plates



have been published throughout the years of intense technical development. One reason for this can be seen in the fact that most of the technical systems operate with complicated copolymers, which do not encourage a fundamental investigation; another reason is that one had to wait for a better understanding of the kinetics of homogeneous polymerization reactions before it seemed hopeful to tackle the more complex heterogeneous systems.

Until 1944 there was only one short note by Fikentscher (5) and two brief reviews (1, 6) which referred to the description and interpretation of polymerization in emulsion. Recently, however, there appeared a very interesting study of the pH in mixtures of aqueous soap solutions and vinyl-type monomers with and without polymerization by C. F. Fryling and E. W. Harrington (7) C. F. Fryling (8), and at the September, 1944, A. C. S. meeting in New York, J. R. Vinograd presented three excellent papers on the solubilization and polymerization of styrene in soap solution (9). At the same meeting V. J. Frilette reported on the polymerization of styrene in aqueous soap solutions (10).

This paper⁵ intends to describe a few experiments on the polymerization of styrene in water and aqueous soap solution and attempts to evaluate the data by proposing a certain mechanism and a certain location for the different elementary steps of the total reaction. The material selected for this investigation (styrene) behaves much simpler than the systems generally used for industrial purposes, and it may be appropriate to emphasize that one should be very cautious in drawing any conclusions from one special case to another.

Polymerization of Styrene in Water and Soap Solutions

A few simple, qualitative experiments may serve as an introduction into some phenomena related to emulsion polymerization.

If one places in a normal test tube a layer of monostyrene (about one centimeter thick) on a column of a dilute potassium persulphate solution in water (see Figure 1) and lets the system stand for several days, the aqueous phase slowly becomes cloudy, and—after sufficiently long

time and occasional gentle shaking or stirring—little white flakes of polymer settle down to the bottom of the tube. One gets the impression that polymerization takes place right in the aqueous phase, although it is difficult to exclude activation of the monomer and growth of the polymer at the interface styrene—water. If one uses substances of higher solubility in water, such as methacrylic ester, vinyl acetate, or acrylonitrile, the cloudiness appears much more rapidly although the area of the interface is the same as before. This is an indication of the fact that at least the formation of active nuclei takes place in the aqueous phase. Whether under the conditions of Figure 1 these nuclei grow in the water or whether they diffuse to the interface and grow there at the expense of the liquid monomer is difficult to decide. A slightly different arrangement, however, shows that active centers, as produced by the interaction of styrene and potassium persulphate (or perborate) in water, can grow in the aqueous phase without being in any direct contact with liquid monomer.

Figure 2 shows a glass tube which contains a certain amount (100 milliliters) of a dilute (1% to 2%) persulphate solution in B. About three centimeters above the surface is suspended a little beaker A containing the monomer. The tube can be evacuated or filled with oxygen or nitrogen and is fitted with a number of necks and outlets in order to add substances, withdraw samples, measure the temperature, stir the aqueous solution, etc. If one lets such a system, or an equivalent arrangement, stand under vacuo and at constant temperature for a sufficiently long time with styrene in the beaker A and persulphate solution in the tube, the solution becomes cloudy, and polystyrene is formed. If air or oxygen is present in the tube instead of nitrogen or vacuum, the appearance of the cloudiness is delayed considerably. Use of a more water-soluble monomer, such as methacrylate, vinyl acetate, or acrylonitrile, makes the cloudiness appear more rapidly and apparently at a rate which is roughly proportional to the solubility of the monomer in water. This seems to indicate that one measures the rate of the polymer formation, and that evaporation and diffusion of the monomer into the aqueous phase are sufficiently rapid to maintain this rate under the conditions of these experiments.

If one adds a small amount of an inhibitor (100 parts per million hydroquinone) to the monomer in A, the course of the polymerization in the aqueous phase is not noticeably affected; if, however, one adds the same amount to the aqueous phase, the appearance of the cloudiness is considerably delayed.

The polymer formed settles slowly down in the capillary and can be withdrawn through a stopcock C. The whole process is very slow if styrene and persulphate solution are used. No quantitative investigation of the polymer formed under such conditions or any determinations of the average DP⁶ and molecular distribution has yet been made.

As one adds increasing amounts of inhibitor to the aqueous phase, the induction period is prolonged roughly proportional to the amount of inhibitor added, as has already been found for the polymerization of styrene in solution by several investigators (11, 12), and the appearance of the cloudiness can be delayed by many weeks.

Increase of temperature at constant inhibitor concentration shortens the inhibition period noticeably. Table 1 shows the results of four runs with the same amount of inhibitor at four different temperatures. Previous investigations (11, 12) have shown that the temperature dependence of the inhibition period allows the estimation of the activation energy of the initiation reaction. Plot-

⁵ Its content was first presented in the "Course on Progress in High Polymer Chemistry" at the Western Reserve University, Cleveland, O., April 14, 1944.

⁶ Degree of polymerization.

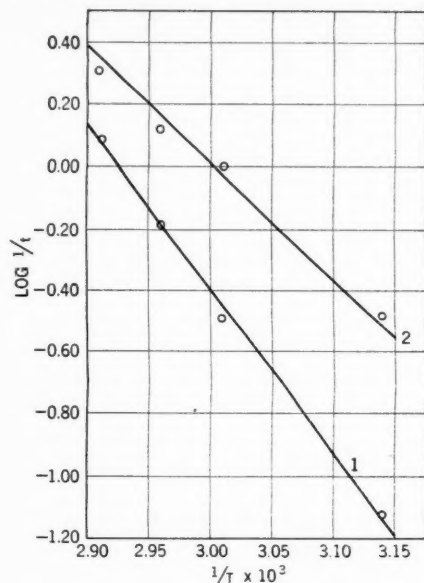


Fig. 3. Reciprocal Length of Inhibition Period versus Temperature

ting the logarithm of the rate of inhibitor consumption in water $k(w)$, which is proportional to the reciprocal duration of the inhibition period $t(w)$ versus $1/T$, one arrives at the line 1 in Figure 3, which is within reasonable limits a straight line and leads to an activation energy of 25,000 calories per mol and to a "collision" constant of $A = 1.2 \times 10^{16}$. It should be pointed out here that this evaluation of the length of the inhibition period implies the assumption that all other factors which may affect the rate of nucleus formation, such as solubility of the monomer in water, or other conditions which may affect the amount of active inhibitor present are not or are only slightly dependent upon temperature. Solubility of the monomer does not depend very much upon temperature within the rather small limits between 45° and 70° C., and the activity of the inhibitor should not be too temperature-dependent either. Both influences work against each other, but it may well be that the correct figure for the activation energy in water is by 2,000 or 3,000 calories per mol larger or smaller than the above value of 25,000.

TABLE I. TEMPERATURE DEPENDENCE OF THE INHIBITION PERIOD IN WATER AND SOAP SOLUTION

T in °C.	T ° Abs.	Abs. t(w) in Hrs.	t(s) in Hrs.	k(w) Hrs ⁻¹	k(s) Hrs ⁻¹	1/T
45	318	13	3	0.077	0.33	3.14×10^{-3}
58	331	3	1.0	0.33	1.00	3.01×10^{-3}
65	338	1.5	0.7	0.66	1.43	2.96×10^{-3}
70	343	0.8	0.5	1.25	2.00	2.91×10^{-3}

$$\frac{\Delta \log k(w)}{\Delta (1/T)} = 5460$$

$$E(w) = 25,200$$

$$A(w) = 1.2 \times 10^{16}$$

$$\frac{\Delta \log k(s)}{\Delta (1/T)} = 3750$$

$$E(s) = 17,200$$

$$A(s) = 1.8 \times 10^{11}$$

This is of the same order of magnitude as the activation energies determined for the polymerization of styrene in bulk, organic solvents, and in aqueous suspension, where values between 23,000 and 28,000 are reported in the literature (1, 2).

All this appears to indicate that under the above conditions, styrene evaporates from B, dissolves (to a very small extent) in the aqueous solution of the catalyst, becomes activated, and grows at the expense of the monomer dissolved in the water. The whole process is very

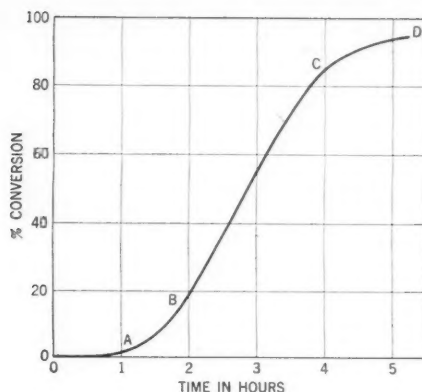


Fig. 4. Conversion Curve—Amount of Polymer Formed versus Time

slow, because of the low solubility of styrene in water. V. J. Frilette (10) has recently, with a refined method, determined the equilibrium solubility of styrene in water at room temperature; it is about 2.2×10^{-3} weight per cent. or 22 p pm.⁷

This situation changes significantly if one uses soap solutions instead of pure water in the tube at B. Fryling and Harrington (7, 8) already have reported in their paper that acrylonitrile polymerizes rapidly if it is in direct contact with water containing soap and catalyst, and they mention that volatile monomers polymerize (or copolymerize) even if they are not in direct contact with the aqueous phase containing the other polymerization ingredients.

We have carried out a few runs using the vapor phase transport as sketched in Figure 2 with a 2% ammonium oleate solution in B, which contained 1% potassium persulfate. At a given inhibitor concentration (air or oxygen in the tube above B or hydroquinone in the aqueous phase) the reaction is now much more rapid than before. Plotting again the logarithm of the reciprocal length of the inhibition period in soap solution $t(s)$ versus $1/T$, one arrives at line 2 in Figure 3, which leads to an activation energy of about 17,000 calories per mol for the initiation reaction in the presence of soap and to a collision constant of $A = 1.8 \times 10^{11}$. A value of similar magnitude was recently determined in a much more accurate way by J. R. Vinograd (9) from the temperature influence on the initial polymerization rate of soap solubilized styrene, and by V. J. Frilette (10) from the temperature influence on the inhibition period of the polymerization of soap-solubilized styrene in water.

McBain (13, 14) in a number of extremely interesting papers has shown that the solubilization of hydrocarbons, such as benzene, toluene, or styrene, in soap dispersions takes place through swelling of the soap micelles in their hydrocarbon portions. In such a case the molecules of the monomer, which enter the well-organized structure of the micelle, might become aligned or oriented and polarized. On the other hand Gee (15) has observed that the polymerization of an unsaturated fatty acid adsorbed at the interface water-air as a monomolecular film occurs with an unusually low energy of activation. Thus it seems not unreasonable to conclude that orientation and polarization of the monomer within the soap micelle is (at least partly) responsible for the drop of the activation energy from about 25,000 calories to about 17,000 per mol. Such

⁷ We are anxious to express our sincerest thanks to Mr. Frilette for letting us know and use a number of his recent figures and for discussing their significance with us. His results will be published elsewhere in the near future.

an idea is already implied in the article of Fryling and Harrington (7)⁸ and was strongly promoted by J. R. Vinograd in his third paper (9).⁹

A decrease of the activation energy by 8,000 calories per mol would increase the rate of the reaction between 45° and 70° C. by a factor of about 10⁶ if the collision or frequency factor would remain unchanged. As Waring (16) recently pointed out, a decrease in the activation energy in a catalyzed system is usually accompanied by a simultaneous decrease of the A factor, which compensates to a certain extent the accelerating effect of the lowering of the energy barrier. In fact, the ratio of the A constants, as estimated from the two lines in Figure 3, is about 6 x 10⁴ in favor of the reaction in water. This may indicate that the accessibility of the styrene molecules for the catalyst in the micelle is considerably smaller than in solution or bulk. If this point is true for the catalyst, it may also be true for those particles responsible for chain transfer¹⁰ or termination, and the fact that the growing chain is less easily accessible in the small soap micelle or in an emulsified particle than it is in a homogeneous solution can explain why the average molecular weight of a polymer formed in emulsion is usually larger than that of a polymer formed in solution or bulk under equivalent conditions. This would mean that the presence of soap increases the rate of polymer formation by decreasing E from 25,000 to 17,000 and at the same time increases the average degree of polymerization by decreasing the accessibility of the growing chains.

Polymerization of Agitated Styrene Emulsions

The experiments described in the preceding paragraph are characterized by an excess of the solubilizing agent. All or most of the monomer in the soap solution is located within the micelles, becomes activated by the initiator, and slowly grows into a polymer. It was, however, of interest to study, at least preliminarily, the rate of styrene polymerization in more concentrated emulsions.

If one carries out this reaction, under conditions which we tried to control as well as was possible and withdraws samples at different times, one gets a conversion curve as shown in Figure 4. Here the amount of polymer formed in per cent. of initial monomer concentration is plotted *versus* time.

The formation of the polymer is at first very slow (*inhibition period*),¹¹ increases then gradually, and reaches a comparatively long, linear range, within which the polymer formation is virtually of the zero order. Later, as the monomer supply becomes exhausted, the curve bends toward the abscissae and reaches a final value between 90 and 100% polymer formed. Conversion curves of this type were observed in all cases of persulfate- or perborate-initiated styrene polymerization, and it may, therefore, be appropriate to discuss briefly their significance.

We have never succeeded in our experiments to get rid completely of the inhibition period. It was possible to reduce its length to fractions of an hour by working

with the purest possible monomer, by excluding oxygen and by working under purified nitrogen and in vacuo. Vinograd (9) has pointed out that for his experimental set up the exclusion of oxygen cuts the induction period down, and similar observations have been made by Frilette (10). The rigorous treatment of polymerization processes without making the steady state approximation, as carried out recently by Ginell and Simha (17) calls for the presence of an *induction period*,¹² which is necessary to provide for a sufficient number of active centers for the reaction to reach its steady state period. We do not believe, however, that in the case of the emulsion polymerization of styrene a state of monomer purity has ever been reached which permits a separate induction period as such. It seems more probable that even after thorough purification of the system, still enough impurities were left to account for the slow start of the reaction as inhibition rather than as induction period. One type of inhibition is due to traces of stabilizers left in the monomer from its shipment. When the emulsion is agitated, they diffuse from the monomer phase into the water, react with the activated monomers, and are eliminated. Consequently more of such impurities will diffuse from the hydrocarbon into the aqueous phase until finally their concentration reaches such a low value that the formation of long chains sets in. Another type of inhibition is due to oxygen, which is mainly dissolved in the water and is there slowly being used up by activated monomers until a limiting concentration is reached, which permits the propagation reaction to develop chains of appreciable length.

As this limiting inhibitor concentration inside of the colloidal particles, in the soap micelles or in the aqueous phase, is approached, activated nuclei of the monomer will get a chance to grow into chains, and polymer will be formed. The rate of this polymer formation increases rapidly as the inhibitor gradually disappears and is reflected by the strongly upward curved part of the conversion curve between A and B (Figure 4). However, because of the fact that some inhibitor still is present and that presumably the reaction products of inhibitor plus activated monomer participate in the termination or transfer steps, the polymer formed during this *acceleration period*¹³ (A to B) has a lower degree of polymerization than the polymer, which is produced afterward. In most of our experiments this acceleration period extended up to a conversion of between 10 and 20% indicating that a not inconsiderable amount of the polymer was produced under conditions which are unfavorable for its degree of polymerization.

The next part of the reaction (B to C) reflects the steady state period during which active centers are efficiently produced through interaction between the monomer and the initiator, are grown out into long chains by the propagation process, and finally stabilized by the termination reaction. During this period termination is mainly brought about by mutual interaction between active centers because all (or nearly all) other chain breakers have been removed during the preceding inhibition and acceleration periods. The rate of conversion during this period is almost constant, and the degree of polymerization of the polymer formed is high. In most of our experiments this period (B to C in Figure 4) extended from between 10 to 20% conversion up to about 85 or 90%.

After this range the conversion curve bends down rather sharply toward the abscissae and gradually reaches a horizontal asymptote between 93 and 97% conversion. During this *deceleration period*¹⁴ the monomer (and possibly also the initiator) concentration has become so low

⁸ (7) p. 117, "soap micelles as catalysts."

⁹ We had the privilege of discussing with Dr. Vinograd his own results and ideas, and we also submitted to him our measurements and their interpretation. We are anxious to express our sincerest gratitude for his comments, which have considerably clarified our own points of view.

¹⁰ In chain transfer (P. J. Flory) growing polymer chains do not simply add a monomer, but transfer to it the activation by exchange of one hydrogen atom.

¹¹ Inhibition period is the time necessary for at least the major portion of the monomer to free itself from the presence of inhibitor; so the formation of long chains from the new purified monomer may begin.

¹² Induction period is the time necessary for the pure monomer to build up a concentration of active nuclei sufficient to establish a significant reaction velocity.

¹³ Acceleration period is the time between the end of the inhibition period and the beginning of the steady state during which polymerization first takes place at a significant and rapidly increasing rate.

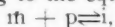
¹⁴ Deceleration period is the time after the end of the steady state during which polymerization takes place at a steadily decreasing rate.

TABLE 2. DIFFERENT PERIODS OF A POLYMERIZATION REACTION

Characterization of Period	Rate during This Period	Reason for the Observed Rate	DP of Polymer Formed During This Period	Reason for the DP	Particles of Emulsion	Reason for Behavior of Particles
Inhibition O—A	Zero	All active nuclei are destroyed by the inhibitor before they can start to grow into a chain	Zero	Propagation reaction has no chance to set in and produce chains	Maintain their initial size (f.i., 4.0 μ)	No polymerization takes place
Acceleration A—B	Rapidly increasing	Inhibitor disappears and gives nuclei the chance to grow into chains	Below average	Reaction products of inhibitor and activated monomer act as chain breakers	Start slowly to decrease in size	Polymerization of smaller particles and in soap micelles changes the ratio soap to monomer in favor of soap and shifts the distribution curve to smaller average particle sizes
Steady State Reaction B—C	Appreciable and almost constant	Steady state is reached; all inhibitor is consumed	Around and above average	No chain breakers are left, and there is still enough monomer for rapid propagation	Decrease steadily in size	
Deceleration C—D	Rapidly decreasing	Monomer concentration decreases. Decomposition products of the catalyst act as inhibitors	Below average	Lack of monomer and the presence of chain breakers (decomposition products of the catalyst) prevent the formation of long chains	Reach a limiting value of diameter (f.i., 0.4 μ)	The reaction decelerates. There are no large monomer particles left which can break up into smaller ones

that both the activation and the propagation reaction, the rate of which is approximately proportional to the monomer concentration, cannot run up to their steady state rate. This has the consequence that less polymer is produced per unit time between C and D than between B and C and also that the polymerization degree of the polymer which is turned out during the last period is smaller than of the material produced between B and C. It seems that another effect contributes to the greatly reduced chain length of the polymer formed during this final period of the reaction. It was first assumed that initiation takes place by spontaneous decomposition of a peroxide molecule into free radicals and a subsequent activation of a monomer by this radical.

Recently, however, there is increasing evidence of the fact that the initiation process is much more complicated (18). The first step seems to be the formation of an addition compound between the monomer (m) and the peroxide (p) according to the equation



leading to the establishment of an equilibrium between this intermediate (i) and its two components according to

$$\frac{[i]}{[m][p]} = K.$$

This intermediate compound forms spontaneously or upon collision with another particle the active nucleus



which has the capacity to grow into a long chain. It may be, however, that the intermediate can decompose in another direction and produce a substance which acts as a chain breaker. Also the peroxide as such can split off oxygen and produce a chain breaking substance. All this has the consequence that toward the end of the reaction the termination process is accelerated, and, therefore, the polymerization degree of the material formed in this late stage is considerably below the average. Finally one has to take into account that the above-mentioned decomposition products of the intermediate and of the peroxide may act as chain-transfer¹⁰ catalysts, which would also contribute to a low molecular weight of the polymer formed toward the end of the reaction.

Another interesting investigation is concerned with the changes taking place in the average size and the size distribution of the particles in the emulsion. It is well known that the average size of the dispersed particles decreases sharply while polymerization takes place. It was found in our experiments that there is no decrease in particle size during the inhibition period and but little change during the acceleration period; while during the steady state reaction the average particle diameter of the emulsion decreases by factors between 0.5 and 0.1. Table 2 contains a summary of all the facts which have been here briefly

enumerated in connection with Figure 4. We shall, in a future article on emulsion polymerization, describe experiments which seem to lend at least qualitative support to the concepts developed in this presentation.

We wish to express our appreciation to Capt. Arn B. Holt, of the Norwegian Air Force, for his cooperation in the experimental work and to E. Valko for his valuable suggestions during the discussions of the experimental results. Especially the authors extend their thanks to the Whitney-Blake Co., Hamden, Conn., and to J. Matielo, Hilo Varnish Co., Brooklyn, N. Y. for their interest and their support of this work.

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(To be continued)

Rubber Clay Consumption Drops

In 1943, 61,223 short tons of clay were used by the rubber industry, according to the Bureau of Mines, United States Department of the Interior. Of this amount 50,964 short tons were Kaolin, and 10,259 short tons, fire clay and stoneware clay. The total was less than half that consumed by rubber makers in 1941, largely because manufacture of many of the products requiring large quantities of filler is now prohibited. Present synthetic rubber compounding calls for reinforcers other than fillers of the clay type. Research and postwar policies on crude rubber imports will strongly influence the future market for clay in the rubber industry. Total domestic clay sold or used by producers in 1943 was 7,380,632 short tons, valued at \$27,654,732, compared with 7,547,087 short tons, valued at \$26,662,897 in 1942.

Recent Russian Literature on Natural and Synthetic Rubber—XII

CONTRIBUTION to Methods of Mechanical Testing of Vulcanized Rubber and Plastic Masses. G. I. Gurevich and P. P. Kobeko, *Kauchuk i Rezina*, 10, 22-33 (1939). SN-46.

In the general case of amorphous substances the deformation under force consists of three components: (a) Reversible initial deformation which is restored almost instantly as soon as the force is removed; this deformation is practically independent of temperature. (b) Reversible highly elastic deformation that increases with time to true-elastic deformation. Whereas the limit to which this deformation increases is for the same force independent of temperature, the time in which the limit is reached does depend on temperature: namely, the time limit decreases as the temperature increases and *vice versa*. (c) Plastic deformation which is an irreversible flow of a substance under the action of a force. The viscosity of simple amorphous substances, such as monomers and low polymers, decreases rapidly under the influence of heat. In such substances an increase in the rate of deformation (under a static force) with increasing temperature is due mainly to an increase of the rate of irreversible flow. On the contrary in a number of high polymers, including vulcanized rubber, the viscosity is quite high even at temperatures at which the rate of highly elastic deformation commences to grow rapidly. For such substances the rate of irreversible flow remains insignificant until temperatures are reached at which point true elastic deformation sets in. For highly polymerized substances the course of their highly elastic reversible deformation is greatly affected by time and temperature. Ignoring the effects of time and of temperature leads to erroneous results and to misleading conclusions as to the suitability of a tested material for definite purposes.

The effect of time of vulcanization on true and initial deformation of vulcanized rubber was tested on samples of SK-B of various plasticity (0.3, 0.35, and 0.6). The samples were mixed with 40% of S, and specimens were vulcanized for different lengths of time. The results are reported in detail. An increase in the degree of vulcanization lowered the true elastic deformation. The usual concepts of plasticity (irreversible) and of elastic deformation of solids, when applied to highly polymerized substances, lead to erroneous results unless time and temperature are taken into account. The usual tests for determining heat resistance and brittleness, etc., of highly polymerized substances, e.g., ebonite, are not indicative unless the dependence of its deformation upon time-temperature is considered. The work of Chuch and Daynes, Erk and Holzmüller and Porrit is discussed.

Highly Elastic Deformation of Polymers. A. P. Aleksandrov and Yu. S. Lazurkin, *Kauchuk i Rezina*, 10, 34-44 (1939). SN-47.

An analysis is made of the time-temperature effect on relaxation phenomena of highly elastic deformation in some polymers. When an external force acts on rubber-like high polymers, two reversible deformations can be observed: resilient deformation and highly elastic deformation. The sum of these two is the total deformation.

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The basic difference between these two kinds of deformation is that resilient deformation is connected with a change of the average distances between the particles, while highly elastic deformation is connected with a regrouping of the particles without changing the average distances between them. An extensive discussion of the mutual relation between these two kinds of deformation and the effect of time and temperature on them is given. Twenty-eight bibliographical items are appended.

Methods for Evaluating Dustless Lampblack. N. A. Pirozhkov, *Kauchuk i Rezina*, 10, 45-49 (1939). M-20.

A number of lampblack samples were tested for their properties other than not-dusting. Of the six samples tested four were aggregated (spherical or irregular aggregates), one was briquetted, and one, used for comparison, was untreated. The tests included: volume-weight, extent of compression under the influence of a load, angle of repose, strength of individual spherules and extent of disintegration in an air current. The procedure for each test is described. The experimental results show that these tests enable evaluating quantitatively the various properties of dustless lampblack. The results also show that dustless lampblack consisting of spherical particles is endowed with desirable properties other than non-dusting. These properties are completely absent from other dustless lampblack (briquettes) or are mostly absent as in the case of irregular aggregated. The described tests concern only the physical properties of the lampblack and shed no light on the behavior of this lampblack in rubber. The latter point should be investigated.

Tires from Kok-saghyz. N. A. Rogov and I. A. Magidov, *Kauchuk i Rezina*, 10, 50-53 (1939). N-21.

The factory "Krasnyi Treugol'nik" prepared tires and inner tubes from kok-saghyz. The kok-saghyz used had the following characteristics: moisture, 0.50; ash, 2.57; soluble in acetone, 8.30; soluble in chloroform, 82.96; insoluble in either acetone or chloroform, 5.67%. The compounding was the same as for similar products made of natural imported rubber with minor changes required by kok-saghyz. Thus aldol- α -naphthylamine was used in place of Neozone D, since the latter blooms out on kok-saghyz. Stearic acid was incorporated into the mix as an anti-aging substance. Samples of the rubber compounded in the plant were submitted to the usual tests and their results are tabulated. The good adhesiveness of unvulcanized mixes with a kok-saghyz base insured a normal assembly procedure. Generally, when using kok-saghyz, the same technological processes apply as when using smoked sheet. Rubber made of kok-saghyz is somewhat more plastic than that made of smoked sheet. Tires and inner tubes of kok-saghyz differ very little from products made from natural imported rubber.

Adaptation of SK for Use in Expansile Rubber

Bags for Vulcanizing Tires. V. G. Aleksandrov and I. V. Garina, *Kauchuk i Rezina*, 10, 53-56 (1939). **SN-48.**

Expansible bags (placed within tires during vulcanization) made of natural rubber serve 30-60 times. They are rejuvenated and used for 30-40 times more. The rejuvenation process can be repeated 3-4 times. Expansible bags made of 100% SK can be used for only 20-40 times, and their rejuvenation is much more difficult because of the deep cracks that they develop. Most damaging to the expansible bags is the sulphur migrating from the carcass of the tire and deposited on the surface of the bag. Expansible bags of NK can be used on the average 45 times before it is necessary to rejuvenate them, and 35 times more with one rejuvenation, making a total average usage of 80 times. With further rejuvenation they may be used up to a total of 140 times. For bags made of 100% SK the maximum use is 50 times, and the average is 20 times. However bags made of SK and coated on the outer and the inner surfaces with a 0.5-0.9 mm. layer of NK had a maximum use of 120 times and an average use (with one rejuvenation) of 70 times. It should be noted when using SK bags that their size does not increase either so much or so quickly as the size of NK bags. Thus the size of SK bags increased only 3.9% after being used 10 times; while NK bags increased 5% after being used only 3-4 times. Failure to take this point into account may result in damage to the vulcanized tires.

How to Prevent the Production of Faulty Tires Caused by the Carcass Separating into Layers. V. G. Aleksandrov, M. V. Novoprutskii, and A. A. Bibikova, *Kauchuk i Rezina* 10, 57-58 (1939). **S-34.**

Various steps and procedures were investigated to prevent layer separation in carcasses made of SK. It was found that the basic cause of this trouble was too low temperature of the water in the expansible bags. By the raising of the temperature of the superheated water in the expansible bags to 130-135° C., the number of failures was reduced to a fraction of 1%. However merely filling the bag with water at the proper temperature does not suffice. For complete elimination of failures or keeping them to a tolerable minimum the water within the bag must be circulated in order to maintain the proper temperature throughout the period of vulcanization. When the temperature of the water within the expansible bag is raised, the time of vulcanization should be reduced accordingly to prevent overvulcanization.

Testing Tires. M. K. Chirkasov, *Kauchuk i Rezina*, 10, 61-65 (1939). **SN-49.**

The author discusses the importance and the value of tire testing results for improving the quality of tires and increasing their mileage. By far the greater part of tires in manufactured (in the U.S.S.R.) of SK, and only a small number of imported natural rubber, which soon will be replaced by home-grown rubber. Widespread and careful testing of tires and an analysis of the results with a view of improving recipes and production methods are of paramount importance. Testing of tires should be done in the laboratory as well as under various road conditions and climates. The author also discusses the existing testing facilities, points out their inadequacy, and makes suggestions for improvements in the procedures used.

Steam Filled and Air Filled Expansible Bags for Use in Tire Repair. R. V. Romanov, *Kauchuk i Rezina*, 10, 66-69 (1939). **SN-50.**

A discussion of the materials used for expansible bags, their construction, and their proper use is given.

Regenerating Rubber by a Method of Thermo-Swelling. P. P. Barabanov, *Kauchuk i Rezina*, 10, 70-72 (1939). **SN-51.**

Natural rubber is readily regenerated by treating it thermally in a kettle or some other suitable device. When similar regenerating processes are applied to SK-B, the product turns hard and coarse instead of becoming plastic. The SK product is hard to use because it does not mix with other ingredients. This behavior of SK can be attributed to its further polymerization and growth of its molecular chains; whereas in the case of natural rubber the molecular chains break up as result of thermal action.

SK was successfully reclaimed by a procedure consisting of swelling the SK in a mild solvent. As source of SK were used galoshes made originally of this material. As solvents were used those easily available, such as cheap standard compositions of petroleum oils. One of the aims was to adapt the process to the available equipment. Essentially the process of regenerating SK is as follows. The scrap (galoshes) is washed and ground (coarsely). The ground scrap is treated with an experimentally determined quantity of the oil and allowed to swell. Next it is treated in a H_2SO_4 solution, washed, neutralized, and again treated with a known quantity of the oil to complete the swelling process. Finally the devulcanized product is dried, rolled, and refined. The regenerated product comes up to the standards set for regenerated natural rubber, except for a higher acetone solubility and a lower chloroform solubility. The higher acetone solubility is due mainly to the presence in the regenerate of oils used in the process which are soluble in acetone. Testing of the regenerated SK in production showed that in recipes where it is used, appropriate changes must be made in order to obtain a satisfactory product.

Vulcanizing Rubber Goods by Means of Electricity Outside the Press. N. P. Maslov, *Kauchuk i Rezina*, 10, 75-82 (1939). **SN-52.**

The use of steam in vulcanizing rubber engenders many drawbacks, such as noise of the escaping steam, the tangle of exhaust ducts, condensate on the floor, etc. The use of electric energy as source of heat eliminates most of these. Maslov discusses several possibilities and arrangements for using electricity in vulcanizing processes. Of these, the most desirable method is the use of high-frequency field in which the vulcanized rubber is heated directly, the rubber serving as dielectric. Some preliminary experiments conducted along these lines by the author are related.

Lead Coating as Means for Preventing Corrosion of Vulcanization Kettles. V. E. Mulakevich, *Kauchuk i Rezina*, 10, 84-87 (1939). **SN-53.**

The accumulation of SO_2 , H_2S , and H_2SO_3 in vulcanization kettles, especially at their bottoms, causes corrosion. Of the several methods available for applying lead on to the walls of the kettle, the two most efficient are flame leading and electrolytic deposition. Of these, the former requires tin, and the apparatus must be dismantled. Electrolytic deposition of Pb is both cheap and easy, and the apparatus need not be dismantled. Some experiences with using this method in the plant of "Krasnyi Treugol'nik" are recounted.

(To be continued)

Softeners for GR-S—II

L. E. Ludwig,¹ D. V. Sarbach,¹
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IN ACTUAL practice it is often more convenient for the compounder to think of softeners in terms of the material best suited to impart desired properties to the vulcanizate. A knowledge of which material will yield, for example, highest tensile strength, greatest resistance to tear, highest rebound, or longest flex life should be of fundamental assistance in the design of compounds which will meet service requirements to best advantage.

Variations in Physical Properties Produced by Softeners

The principal physical properties which govern the utility of the finished rubber article receive individual consideration in the discussion which follows. A selection has been made of the softeners which produced the greatest improvement in physical properties of GR-S and also those which detracted from the properties of the original stock. The individual softeners mentioned herein were chosen as typical examples which would best illustrate the most suitable materials for each purpose. In the selection of these materials there is no intent either expressed or implied to exclude other similar materials which in many instances would serve the purpose equally well.

Tensile Strength

The GR-S control stock gave a tensile of 2400 p.s.i. at optimum cure. Of the 600 materials examined, 246, or 41% of the total, increased the tensile above this figure. The increase is distributed as follows:

3,000 p.s.i. and above,	16 materials, or	2.7% of the total
2,800 through 2,999,	43 materials, or	7.2% of the total
2,600 through 2,799,	86 materials, or	14.3% of the total
2,425 through 2,599,	101 materials, or	16.8% of the total

A representative selection of softeners which produced increased tensile strength is listed below together with the maximum produced in each case. The materials have been carefully chosen to illustrate general trends; no attempt is made to list all softeners with tensile above 2,400 p.s.i.

MATERIAL	TENSILE, P.S.I.
Dipolymer oil	3,425
Crude gum turpentine	3,350
Tributyl glycerol triphthalate	3,275
Plastone	3,175
Lauric acid	3,000
Bondogen	2,975
Picoumaron Resin XX-100	2,950
Pentacizer 279	2,900
Turgum	2,900
Pine tar	2,875
Age-Rite Resin	2,825
Tall oil	2,825
P.H.O. plasticizing oil	2,800
Bakelite Resin 4036	2,800
Paraplex X-100	2,800
Ester gum	2,750
Carnauba wax	2,750
Rosin oil	2,725
Butyl cuminate	2,700
Zinc naphthenate	2,675
Soya phosphatides	2,650
Amalgamator Z-4	2,650
Chlor dibutyl carbonate	2,600
Piccolyte S-100	2,600
Methyl abietate	2,550
Cardolite 1073	2,550
Pictar	2,525
Asphalt No. 6	2,525
Soybean polyester	2,500
Faraflex	2,475
Wool grease	2,475
Triethanolamine	2,475
Stearine pitch	2,450
Solid Linseed 4115	2,450

A few softeners, listed below, had an adverse effect on

tensile strength. Values given are for optimum cure. Materials which retarded cure are not considered.

MATERIAL	TENSILE, P.S.I.
Glue	1,300
Kerosene	1,675
Rosin oil	1,600
Dimethylamide ST-1 Acid	1,350
Dimethyl chlor benzophenone	1,300

Elongation

The elongation of the GR-S control stock at optimum cure was 400%. Of the 600 materials treated in this study, 120, or 20% of the total, raised the elongation to 450% or higher. This increase is distributed as follows:

450 to 500%—14 materials, or	2.3% of the total
500 to 600%—60 materials, or	10% of the total
600 to 700%—38 materials, or	6.4% of the total
700% and over—8 materials, or	1.3% of the total

The values at optimum cure for materials which gave increased elongation are listed herewith. As in the previous case, no attempt has been made to list all of the materials. A selection was made which was designed to be representative of the type of material which can be expected to yield increased elongation.

MATERIAL	ELONGATION, %
Dipentene	620
Pine tar	695
Rosin oil	540
Oleic acid	515
Triethanolamine	600
Plastone	580
Bondogen	775
Dipolymer oil	515
Soft coal tar	500
Refined Bogol	660
Chlor dibutyl carbonate	630
Cardanol 1062	600
Keto butanol	705
Stanolind asphalt No. 6	540
Tetrahydro furfuryl diacetate	720
Bakelite resin 4036	590
Crude gum turpentine	670
Plastogel	545
Synprowax	710

Modulus

Low modulus at optimum cure is a desirable feature for many purposes, particularly when it is accompanied by increased elongation, good tensile strength, and low hysteresis. A combination of properties of this nature is especially valuable in carcass and tread stocks. A selected group of typical softeners which produced low modulus with a desirable balance of the above associated features is presented herewith. Data represent 45-minute cures, which are quite close to the optimum in every case.

MATERIAL	MODULUS P.S.I.	TENSILE P.S.I.	ELONGATION %	HYSTERESIS AT °F.
Control	1,450	2,350	385	43
Pine Tar	600	2,400	695	65
Rosin Oil	975	2,525	525	45
Diocetyl phthalate	950	2,150	430	37
Plastone	925	3,050	580	53
Refined Bogol	725	2,650	660	67
Methyl abietate	800	2,550	575	39
Baker's No. 15 oil	875	2,475	545	67
Picoumaron Resin XX25	750	2,650	590	58
Bakelite Resin 4036	800	2,600	590	55
Crude gum turpentine	725	2,900	670	67

Hardness

The production of a cured stock with lower durometer hardness is considered one of the prime requisites of any softener. This property is a function of the cured stock which is not always connected with plasticity, since many materials which soften the uncured stock do not give a

¹With B. F. Goodrich Co., Akron, O.

corresponding decrease in durometer hardness of the vulcanizate. Hardness of the control stock was 63 and 65, respectively, for the 30- and 45-minute cures. The data indicate that 314 materials, or 52.3% of the total, produce a decrease of five points or more. A decrease of ten points is considered to have definite practical significance, and 81 materials, or 13.5% of the total, exhibited a decrease to 54 or less. Durometer readings for the 30- and 45-minute cures of representative materials selected from this group appear below.

MATERIAL	DUROMETER HARDNESS	
	30'	45'
Control	63	65
Mineral oil	55	57
Pine tar	50	53
Paraflux	57	59
Cumar P-25	55	59
Wool grease	52	55
Cottonseed oil	53	56
Rosin oil	56	58
Dibutyl phthalate	57	60
Plasticizer SC	56	57
Bondogen	54	56
Dipolymer oil	57	58
Diphenyl	56	58
Refined Bogol	52	51
Plasticizer No. 6	53	56
Cardanol 1062	54	55
Vistac	56	56
Diamyl phthalate	55	58
Bardol B	56	58
Butyl naphthenate	54	56
Hexyl ether	54	55
Diethyl stearamide	55	56
Tarzac	55	58
Naftolen R-100	55	57
Stanolind Asphalt No. 6	53	57
Bakelite 4036	56	57

Out of 600 softeners, 70, or 11.6% of the total, increased the hardness to 65 or above. An increase to 70 or above was observed in 17 cases. Typical members of this group appear below. Pitches are also so employed successfully.

MATERIAL	DUROMETER HARDNESS	
	30'	45'
Control	63	65
Shellac	60	66
Glue	67	68
Benny resin	70	70
Durez 7285	70	72
Vultac No. 3-(XP-171)	71	73
Butvar resin	72	74
Gilsonite	64	65

Rebound

With the exception of certain esters, very few materials will produce an appreciable increase in the rebound of GR-S. The control stock had a Schopper rebound of 42%. A review of the softeners in this study showed that 214 materials, or 35.6% of the total, maintained a rebound of 42% or greater. Only 48 materials increased the rebound to 45 or above. A group of typical softeners responsible for this increase follows:

MATERIAL	REBOUND, %
Mineral oil	47
Raw linseed oil	46
Diphenyl oxide	48
Dibutyl phthalate	46
Tributoxy ethyl phosphate	45
Butyl cuminate	48
Dibenzyl ether	46
Bardol B	45
Plastoflex 10	46
Di-isobutyl adipate	45

The maximum increase in rebound produced by any of these softeners was reached at about the ten-part addition. Larger amounts will usually result in no further increase. A large majority of the softeners either had no effect on rebound or gave a marked decrease.

Values for compression set were not determined during this study. It is interesting to observe, however, that materials which produce high rebound usually yield low values for compression set.

Tear Resistance

At room temperature, the control stock had an average

tear resistance of 34 pounds per $\frac{1}{16}$ -inch thickness of the test piece and 18 pounds at 212° F. The great majority of softeners decreased tear resistance; the average values for all materials were 27 pounds at room temperature and 12 pounds at 212° F. Out of the entire list less than 30 softeners maintained the tear resistance of the original GR-S stock or evidenced any tendency to yield an improvement. No more than ten materials actually demonstrated conclusive ability to produce an increase at room temperature. The best from this group are listed below. Values recorded represent 30- and 45-minute cures.

MATERIAL	ROOM TEMPERATURE TEAR RESISTANCE	
	P.S.I./ $\frac{1}{16}$ -IN. THICKNESS	
Control	30.0	27.0
Butyl lactate	38.6	33.1
Age-Rite Resin	43.4	44.6
Cardosol	36.8	35.6
Resin T-132	43.2	36.4
Benzoic acid	42.3	32.9
Asphaltum No. 4	44.7	36.7
Rubber Softener No. 3	45.9	38.2

Resistance to tear at elevated temperatures is a particularly desirable feature, as, for example, at the close of a curing period when the hot vulcanized article must be removed from various shaped mandrels without tearing. At the ten-part addition employed in this study, very few of the softeners produced a marked increase in tear resistance at 212° F. A desirable trend in this direction was exhibited by a few materials which are listed below, with values for the 30- and 45-minute cures. Certain tars, not included in this list, gave abnormally high values which must be investigated more thoroughly.

MATERIAL	212° TEAR RESISTANCE	
	P.S.I./ $\frac{1}{16}$ -IN. THICKNESS	
	30'	45'
Control	17.0	16.0
Terposol 8	21.6	20.8
Vultac No. 1-(XP-35)	31.8	34.8
Phenyl diethanolamine	18.2	21.3
Tails of Pinene	20.3	22.8
PHO plasticizing oil	23.0	23.7
Glycerol chlor benzoate	25.6	26.6
Benzyl polysulphide	26.6	25.9
Ethyl ricinoleate	18.3	21.4
Softener Type 1, Hard Grade	21.1	21.0
Softener Type 4, Hard Grade	20.8	19.1

Plasticity

A true softener should not only soften the uncured stock as evidenced by an increase in plasticity, but should give a corresponding decrease in hardness of the vulcanizate. High plasticity is directly associated with ease of processing and must form the principal criterion by which the efficiency of any softener is judged. The most desirable softener is often one which will produce the greatest increase in plasticity, since smaller amounts will be needed to obtain a desired result, and other physical properties will not be affected in an adverse manner. No direct relation was found to exist between plasticity and durometer hardness. In many cases the most effective softeners from the standpoint of plasticity did not give the softest cured stocks. The majority of materials which gave high plasticity showed a tendency to yield low flex resistance. Of 110 materials with a plasticity of 60 or above, 72% withstood less than 100,000 flexures on the DeMattia machine. A Goodrich plasticity of 55 or above is regarded as an indication of effective softening action. Out of the entire list of softeners, 175, or 29% of the total, gave a plasticity of 55 or above. Only 41, or 6.8% of the total, gave a value of 65 or above. The softeners listed below are typical of the materials which gave high values. Data recorded show the Goodrich plasticity at 85° C. (with a five-pound weight) since this value is considered to be most significant.

MATERIAL	PLASTICITY, 85° C.
Control	24.0
3-nitro-4-heptanol	75.5
Parafflux	70.6
Dicapryl phthalate	69.4
Beeswax	68.3
Cardanol 1062	67.8
Tributoxy ethyl phosphate	67.5
Circo light process oil	67.1
Plasticizer DN-2-182-C	66.2
Reogen	64.1
Oroplast M	63.0
Picocizer 30	62.2
Naftolen R-100	62.0
Pine Tar	61.9
Cumar P-25	60.7
Chlor dibutyl carbonate	60.5
Rosin oil	60.4
Synprowax	57.5
Bardol B	57.5

Not all of the softeners produced an increase in plasticity. A group of 99 materials, or 16.5% of the total, had a plasticity of 25 or below. Typical members follow:

MATERIAL	PLASTICITY, 85° C.
Control	24.0
Plasticizer No. 42	9.8
Advagum 1098	11.5
Butvar Resin	13.9
Baker's 785 oil	14.7
Pentacizer 279	14.8
Bakelite Resin XR-9358	16.1
Gilsonite	19.7
Hardwood pitch	21.1
Resin R-6-3	23.7
Paraplex X-100	24.2
Guaicol	24.3

Flex Life

The GR-S control stock withstood 50,000 flexures on the DeMattia machine. A considerable number of the softeners extended the flex life beyond this point. It was observed that 214 materials, or 35.6% of the total, produced 100,000 flexures or above. Sixty materials, or 10% of the total, gave 200,000 or above; while only 15 or 2.5% of the total, reached 500,000 or over. Mere increase of flex life has little practical value unless certain related conditions are fulfilled. An uncured stock will show a large increase in flex life which has little significance until the stock has been brought up to normal cure. Hysteresis, or heat rise during flexing, should preferably remain at a low figure in order to minimize the tendency to generate excessively high temperatures in tires or other articles subjected to rapid flexing for prolonged periods.

MATERIAL	FLEX CYCLES	HYSTERESIS ΔT , °F.	CURE
Control	50,000	44	Normal
Dipentene	210,000	39	Normal
Aceto-acetic ester	760,000	..	Under
Refined Bogol	1,300,000	67	Normal
Plasticizer 9	250,000	53	Normal
Benny resin	2,000,000	137	Under
Benny resin (plus S)	100,000	93	Normal
Chlor dibutyl carbonate	500,000	61	Under
Hercosol 80	260,000	68	Normal
Ricinoleic acid	260,000	47	Normal
Pine tar	640,000	49	Normal
Tetrahydroxy dioxan	2,000,000	33	Under
Wood rosin	260,000	149	Under
Wood rosin (plus S)	190,000	59	Normal
Picoumaron Resin XX25	260,000	58	Normal
Tetrahydro furfuryl diacetate	510,000	131	Under
Butyl trichlor benzoate	430,000	58	Under
Para Resin 1723-2	300,000	62	Normal
Crude gum turpentine	280,000	66	Under
Parafflux	210,000	69	Normal
Oroplast H	270,000	43	Normal
Synprowax	280,000	108	Under
Bodied soya bean polyester	135,000	47	Normal

It follows that the most desirable stock is one in which maximum increase in flex life, accompanied by low hysteresis, is obtained at optimum cure. These factors must receive due consideration when the above data are examined. Typical materials which lengthened flex life are listed along with the number of flexures which they withstood. Corresponding values for hysteresis and state of cure are presented in each case. Two values are given for rosin and Benny resin to illustrate the results obtained when additional sulphur was employed.

Many of the above materials have been tested in a variety of tread and carcass stocks. It is quite evident that flex life of GR-S can be prolonged appreciably through the application of suitable softeners. Other data for bodied soya bean polyester show much better flex life than the above table would indicate. Results with this material have been outstanding, and it is interesting to observe that the improvement in flex life is associated with uniformly low hysteresis. Some softeners, including soya polyester, improve flex life in stocks containing higher loadings of both softener and black.

When flexed on the DeMattia machine, the test pieces show breaks of different types. In most cases the break is even and proceeds straight through the test piece; failure occurs in a relatively short time. In some cases a laminated type of break occurs which postpones ultimate failure for an appreciable period of time since crack growth in any one direction is retarded. From the theoretical standpoint, at least, the phenomenon of lamination holds considerable interest. It can be induced by various means such as: (a) the presence of a small amount of large particle-size materials, (b) the use of a mineral pigment in addition to black, (c) compounds containing mixed blacks, and (d) certain softeners.

Tack

The great majority of softeners produced very little increase in tack at the ten part addition. Tack was determined as previously described in compounding procedure, item 9 (in Part I). The rating is purely an arbitrary one and subject to personal error. All observations, however, were made by the same operator and afford a reasonably accurate picture of the best tackifiers. Only 75 materials, or 12.5% of the total, were rated better than poor. Very few of them produced sufficient tack to be of practical value for factory processing operations. Only 25 were rated fair or better. While they were not considered during the present study, it should be observed that certain blends of resinous materials, for example Zirex, with liquid plasticizers like Terposol 3, make effective tackifiers. A representative selection of the most satisfactory individual tackifiers is presented herewith.

MATERIAL	TACK RATING
Bakelite resin 4036	Good
Crude gum turpentine	Good
U-G-5796 resin	Fair-Good
Synthol	Good
SPC tackifier	Good
Butac	Good
Synprowax	Fair
HDH rosin	Fair
Benny resin	Fair
Rosin oil	Fair
Vutac No. 1-(XP-35)	Fair
Naftolen	Fair
Oroplast M	Fair
Pentacizer 180	Fair
Methyl ricinoleate	Fair
Ester gum	Fair
Zirex	Poor-Fair
Cumar P-25	Fair
Bunatak U	Fair
Polytac	Fair
Control—no softener	Poor

Processing

In addition to softening the cured stock an efficient plasticizer must be of definite assistance during the series of processing operations in the factory which are required to convert the crude elastomer into a finished product ready for service. Increased plasticity indicates a softer stock which reduces power consumption and hastens the incorporation of pigments and other compounding ingredients. Many of the softeners were of assistance in this respect. Those with high Goodrich plasticity usually gave stocks with uniformly good milling behavior. The softener itself should be taken up readily and exert its

full softening action immediately. Tubing, calendering, and friction coating should be facilitated.

Considerable importance is attached to the tubing index as an indication of processing behavior. Very few of the softeners effected an improvement having any practical significance at the ten-part addition. The fact should not be overlooked, however, that stocks containing higher percentages of many of these softeners together with higher loadings of pigment would extrude satisfactorily. Only 31 of the softeners show a tubing index of 13 or above. An index of 12 is considered the minimum for reasonably efficient factory processing. Typical of the materials which brought about better tubing are the following.

MATERIAL	TUBING INDEX
Control	12
Cottonseed fatty acid	15
Ricinoleic acid	15
Refined Bogol	14
Oleic acid	13
Plastone	13
Soft coal tar	13
Methox	13
Vistac	13
Lauric acid	13
Naftolen R-100	13
Oroplast M	13
Amalgamator Z-4	13

Rate of Cure

Addition of softeners is observed to produce variation in the rate of cure. Sometimes, as in the case of amines, it is an accelerating effect. At other times it may be unsaturation or the acidic nature of the material which causes a retardation of cure. With some softeners, such as rosin or certain of the gelled oils, it is necessary to increase the amount of sulphur to reach optimum cure. Amines, fatty acids, and some of the coal-tar fractions accelerate cure. Neutral, saturated compounds have little effect. Most unsaturated compounds and many which are acidic in nature retard cure. Additional sulphur is usually added by the compounder to offset the effect of unsaturation. Variation in rate of cure produced by representative softeners is presented in the following table.

	OPTIMUM CURE MIN. AT 280° F.
Vultac No. 2-(XP-164)	10
Triethanolamine	15
Plastone	30
Control—no softener	45
Parafflux	45
Pine tar	60
Solid linseed oil	75
Plasticizer XP-149	150

Reversion of Cure

In the case of several softeners a tendency to produce reversion of cure in a manner similar to a natural rubber stock was observed. This is evidenced by a lowering of the modulus and a higher elongation with increasing time of cure. A reverting stock should lessen the danger from overcure and also yield compounds which have better resistance to aging. Highly polymerized vegetable drying oils of the gel and solid types exhibit the greatest degree of reversion. Softeners containing cumar and a few of the tetrahydro-furfuryl derivatives show a minor tendency in this direction, but are nevertheless considered worthy of future investigation. The materials which induced this phenomenon are presented herewith.

MATERIAL	
Castor oil	Paralube
Age-Rite Resin	Dipolymer oil
Dicyclohexylamine	Turpentine cresylic acid
Butyl cuminate	Glycerol isopropyl ether
Terposol 3	Solid linseed oil
Tricresyl phosphate, chlorinated	Polintex D
Phenyl diethanolamine	

Interpretation of Results

Whenever a softener is used for a specific effect, due

attention must be paid to any other incidental effects which it may have. It is obvious that if a softener is added to improve processing, its effect on tensile strength must be considered. Or, if it is added to lower the freezing point, the effect on hardness must be considered. Less obvious, but equally important is the necessity of observing the effect of softener on cure. Any softener, if used in large volume in a compound, will affect the cure, by dilution of the sulphur and accelerator in relation to the rubber if in no other way. Many softeners have a definite retarding action even in amounts of 10 PHR, by virtue of their chemical unsaturation, their acidity, or similar causes. Others accelerate cure, and still others may act as vulcanizing agents. Direct comparisons in the same recipe and at the same cure may be misleading unless properly interpreted. To get an accurate answer adjustments in recipe, or cure, or both may be needed. Since this requires a number of experiments, it was necessary to resort to interpretation in the comparison of softeners.

In the interpretation of curing effects we find that with increasing state of cure the modulus and hardness increase, while elongation, hysteresis, and flex life decrease. To determine the effect of softeners it is necessary to make comparisons at equivalent cures. For selecting equivalent cures we prefer the use of the inflection point of the time-modulus curve. In the standard recipe, equivalent does not necessarily mean equivalent states of cure because one softener may require more sulphur or more accelerator than another. Both of these factors must be considered in the interpretation of results from the base recipe. For example, if a softener shows remarkably high flex life, it is important to check the hysteresis. If the hysteresis is also very high, it is probable that the improvement in flex life is largely a cure effect.

In general we have found that the better softeners decrease modulus and hardness and increase hysteresis and flex life. The relation between hysteresis and flex life is constant within rather narrow limits. This means that only small improvements in flex life have been obtained without corresponding sacrifice in hysteresis. What we hoped to find was a softener which does not follow this general rule, but which would give a considerable increase in flex life without this increase in hysteresis. The reproducibility of tests and the possibility of error with individual measurements or with single compounds must always be borne in mind. Before startling results are accepted, they should be thoroughly checked. In the final analysis the important consideration for any commercial compound is the balance between processing properties and performance of the product. Since processing and cured property requirements will both vary for each product, a great variety of softeners and concentrations thereof will be required to fill all needs.

Use of This Survey Study

With the background furnished by this study one can select certain of the more promising softeners for more intensive investigation. Such an investigation might consist of the following steps:

1. Determination of the effects of varying concentrations of softeners in several different-type recipes. These might include in addition to the tread-type recipe used in this study stocks compounded with blacks other than MPC black and stocks compounded with mineral fillers. In each of the recipes and for each softener and each concentration the optimum level of cured properties should be established.

2. Factory trials of selected softeners to correlate plasticity and tack observations made in the laboratory with

those obtained under factory conditions and also to check effects on the quality of products which frequently cannot be predicted from laboratory results.

Index of Materials Tested

A complete list of all materials tested during the course of this study is presented herewith. They are divided into 16 groups based primarily on chemical composition. Certain materials identified by the manufacturer by number only are termed plasticizers and are listed in the final group of miscellaneous products. In many instances the name of the manufacturer is included to provide accurate identification. No suppliers' names are listed in the case of pure chemicals and a number of other materials in common use which can be obtained from several sources.

Class 1 — Esters

Tricresyl phosphate
Triphenyl phosphate
Triphenoxy ethyl phosphate (Ohio Apex, Inc.)
Tributyl phosphate
Tricresyl phosphate, chlorinated
Amyl octyl ortho phosphate (iso)
Dibutyl phthalate (Carbide & Carbon Chemicals Corp.)
Diethyl phthalate
Tributyl glycerol triphthalate (American Cyanamid & Chemical Co.)
Dicapryl phthalate
Hexahydro butyl phthalate
Diamyl phthalate
Di (2 ethyl hexyl) phthalate
Benzyl butyl phthalate
Amyl phenoxy ethyl phthalate (bis p. tert.)
Diamyl phenoxy ethyl phthalate (bis)
Butyl capryl phthalate
Cyclohexyl butyl phthalate
Dibutyl glycol dipthalate
Methyl cyclohexyl phthalate
Diamyl phthalate
Methox (di methoxy ethyl phthalate) (Ohio Apex, Inc.)
Kromisol (di butoxy ethyl phthalate) (Ohio Apex, Inc.)
Dimethyl cyclohexyl phthalate
Butyl cellosolve sebacate
Tetrahydrofurfuryl sebacate
Dibutyl sebacate
Ditetrahydrofurfuryl sebacate
Dimethyl sebacate
Butyl lactate
Methyl cyclohexyl lactate
Ditetrahydrofurfuryl adipate
Methyl cyclohexyl adipate
Isobutyl adipate (di)
Methyl tetrachlor stearate (Hooker Electrochemical Co.)
Methyl hexachlor stearate (Hooker Electrochemical Co.)
Methyl pentachlor stearate (Hooker Electrochemical Co.)
Butyl cellosolve stearate
Cyclohexyl stearate
Methyl cyclohexyl stearate
Ethyl hexylidene glycerol stearate
Butyl stearate
Butyl cellosolve oleate
Tetrahydrofurfuryl oleate (Hooker Electrochemical Co.)
Kapsol (methoxy ethyl oleate) (Ohio Apex, Inc.)
Butyl acetyl ricinoleate (Baker Castor Oil Co.)
Ethyl ricinoleate P-2 (Baker Castor Oil Co.)
Methyl ricinoleate P-1 (Baker Castor Oil Co.)
Glyceryl triacetate ricinoleate P-8 (Baker Castor Oil Co.)
Benzyl benzoate
Bornyl o-benzoyl benzoate
Octyl chlor benzoate
Glyceryl chlorbenzoate
Tetrahydrofurfuryl dichlorbenzoate
Capryl dichlor benzoate
Amyl trichlor benzoate (iso)
Propyl trichlor benzoate
Benzoate of diol fraction (Hooker Electrochemical Co.)
Isopropyl trichlor benzoate
Amyl trichlor benzoate (normal)
Butyl trichlor benzoate
Tributyl acetonate
Amyl azelate (di-normal)
Butyl azelate (di-iso)
Butoxy ethoxy ethyl azelate
Cellosolve acetate (Carbide & Carbon Chemicals Corp.)
Diethylene glycol diacetate (Carbide & Carbon Chemicals Corp.)
Tetrahydrofurfuryl o-chlor phenoxy acetate
Phenyl ethyl o-chlorphenoxy acetate
Tetrahydrofurfuryl acetate, di
Aceto-acetic ester (Carbide & Carbon Chemicals Corp.)
Butyl cuminate (normal)
Chlor dibutyl carbonate
Chlor dioctyl carbonate
Butyl carbamate (iso)
Octyl benzyl mercapto carbonate
Butyl cellosolve (Carbide & Carbon Chemicals Corp.)
Acetyl tributyl citrate
Triethyl citrate
Butyl acetyl methyl pimelate
Methyl abietate
Methyl naphthenate
Ethylene glycol dimethacrylate
Diethylene glycol dipelargonate
Esters of 15% fatty acid (Armour & Co.)
Esters of 20% fatty acid (Armour & Co.)

Amyl phenoxy ethyl maleate (bis p. tert.)
Bodied soya bean polyester (Procter & Gamble Co.)
Propylene glycol dilaurate
Ditetrahydrofurfuryl oxalate
Ditetrahydrofurfuryl fumarate
Tetrahydrofurfuryl oxalate (Hooker Electrochemical Co.)
Staybelite ester, No. 3 (Hercules Powder Co.)
Levulinic ester of isobutyl hydroxy acetate
Tetrahydrofurfuryl levulinate
Diamyl maleate
Chlor xylene, butyl ester
Butyl laurate D.B.P.
Zinc naphthenate
Staybelite ester, No. 2 (Hercules Powder Co.)
Ditetrahydrofurfuryl maleate
Mulsor 3 CW (Synthetic Chemicals Co., Inc.)
Mulsor 308 (Synthetic Chemicals Co., Inc.)
Cardanol acetate (Irvington Varnish & Insulator Co.)

Class 2 — Aromatic Hydrocarbons

Xylol
Decaline
Diphenyl
Diamyl naphthalene (Sharples Chemicals, Inc.)
Amyl benzyl naphthalene (Sharples Chemicals, Inc.)
Tetralin H
Monamyl naphthalene (Sharples Chemicals, Inc.)
Ethylated diphenyl
Triamyl benzene (Sharples Chemicals, Inc.)
Acenaphthene

Class 3 — Chlorinated Hydrocarbons

Dichlor benzene, ortho (Hooker Electrochemical Co.)
Dichlor benzene, para (Hooker Electrochemical Co.)
Aroclor 5460 (Monsanto Chemical Co.)
Aroclor 1242 (Monsanto Chemical Co.)
Chlor naphthalene, alpha (Hooker Electrochemical Co.)
Aroclor 1248 (Monsanto Chemical Co.)
Ethyl polychlor benzene
Halowax oil, No. 1000 (Halowax Products Division, Union Carbide & Carbon Corp.)
Amyl chlor naphthalene (Sharples Chemicals, Inc.)
Montar No. 4 (Pitch No. 4) (Monsanto Chemical Co.)

Class 4 — Ethers

Dibenzyl ether
Nitro diphenyl ether, ortho
Hexyl ether (Carbide & Carbon Chemicals Corp.)
Glyceryl mono isopropyl ether
Diphenyl ether
Polyvinyl butyl ether—Re-412-A (General Aniline & Film Corp.)
Polyvinyl butyl ether—Re-412-B (General Aniline & Film Corp.)
Glyceryl a-methyl a-phenyl ether
Diphenyl bornyl ether

Class 5 — Ketones

Acetophenone
Phorone (Carbide & Carbon Chemicals Corp.)
Phorone, iso (Carbide & Carbon Chemicals Corp.)
Xylol heptadecyl ketone
Lauryl tetrahydro naphthyl ketone
Chlor dimethyl benzophenone
Hydrogenated difurfurylidene acetone
Phenyl propyl ketone
Acetonyl acetone

Class 6 — Alcohols

Glycerine (Swift & Co.)
Keto butanol, crude
3-nitro 4-heptanol
Diamyl phenoxy ethanol (Sharples Chemicals, Inc.)
Benzyl alcohol (Hooker Electrochemical Co.)
Octyl alcohol (Carbide & Carbon Chemicals Corp.)

Class 7 — Phenols

Vultac No. 1 (XP-35) (Sharples Chemicals, Inc.)
Vultac No. 2 (XP-164) (Sharples Chemicals, Inc.)
Vultac No. 3 (XP-171) (Sharples Chemicals, Inc.)
Chlor phenol, para
Dibutyl m-cresol
Diamyl phenol (Sharples Chemicals, Inc.)
Rtlyl catechol (tertiary)
Guaiacol
Wood phenols, refined (Southern Pine Chemical Co.)
Cardanol 1062 (Irvington Varnish & Insulator Co.)

Class 8 — Amines

Triethanolamine (Carbide & Carbon Chemicals Corp.)
Phenyl diethanolamine (Carbide & Carbon Chemicals Corp.)
Dicyclohexylamine

Class 9 — Vegetable Oils

Linseed oil, raw
Linseed oil, blown
Linseed oil, solid, 4115 (R. B. H. Dispersions, Inc.)
Linseed oil, solid, 4127 (R. B. H. Dispersions, Inc.)
Linseed oil, treated (R. B. H. Dispersions, Inc.)
Linseed oil, solid, 4125 (R. B. H. Dispersions, Inc.)
Linseed oil, polymerized, No. 2000 (Carter-Bell Mfg. Co.)
Linseed oil, plastogel (Canada Carbon Black Co., Ltd.)
Linseed oil, gel (Congoleum-Nairn, Inc.)
Linseed oil, resin-rubber extender, LV-1125 (W. A. Reynolds Co.)
Linseed oil, M-37 OKO (Archer Daniels Midland Co.)
Linseed oil, Colloxin (Congoleum-Nairn, Inc.)
Linseed oil, Polintex D (G. A. Wharry Co.)
Linseed oil, Polintex L (G. A. Wharry Co.)
Baker's blended castor (Baker Castor Oil Co.)
Baker's castor oil (Baker Castor Oil Co.)

Baker's No. 15 oil (Baker Castor Oil Co.)
 Baker's No. 785 oil (Baker Castor Oil Co.)
 Baker's No. 781 oil (Baker Castor Oil Co.)
 Baker's No. 5 oil (Baker Castor Oil Co.)
 Baker's No. 122-34 oil (Baker Castor Oil Co.)
 Baker's No. 122-35 oil (Baker Castor Oil Co.)
 Baker's No. 40 oil (with boron trioxide) (Baker Castor Oil Co.)
 Baker's No. 781 oil emulsion (Baker Castor Oil Co.)
 Baker's Insolubilized 781 oil (Baker Castor Oil Co.)
 Baker's 2XAC oil (Baker Castor Oil Co.)
 Baker's No. 40 oil (Baker Castor Oil Co.)
 Baker's Pale 16 oil (Baker Castor Oil Co.)
 Turkey red oil
 Jewel oil (Swift & Co.)
 Soybean oil, refined (Swift & Co.)
 Soybean oil, solid, 4205 (R. B. H. Dispersions, Inc.)
 Soybean oil, solid, 4212 (R. B. H. Dispersions, Inc.)
 Soybean oil, solid, 4213 (R. B. H. Dispersions, Inc.)
 Soya phosphatides (Central Soya Co.)
 Liqro (Industrial Chemical Sales Division, West Virginia Pulp & Paper Co.)
 Bogol, refined (Gaylord Container Corp.)
 Tall oil, crude
 Utonol R (Union Paper Corp.)
 Cottonseed oil (Swift & Co.)
 Palm oil, low acid
 Peanut oil (Magnus, Mabee & Reynard, Inc.)
 Spry
 Cardolite 869 (Irvington Varnish & Insulator Co.)
 Cardolite 816 (Irvington Varnish & Insulator Co.)
 Cardolite 853 (Irvington Varnish & Insulator Co.)
 Cardanol acetate (Irvington Varnish & Insulator Co.)

Class 10 — Fatty Acids

Stearic acid
 Oleic acid
 Cottonseed fatty acids
 Lauric acid
 Methyl ester of CI-5 corn oil fatty acids
 Ricinoleic acid P-20

Class 11 — Petroleum Products

Group A — Solvents

Kerosene
 Hydroformer bottoms (Battelle Memorial Institute)
 Vacuum flash tower distillate (Battelle Memorial Institute)
 Fuel oil

Group B — Mineral Oils

Mineral oil, thin white
 Paraffin base oil, pale
 Circo light process oil (Sun Oil Co.)
 Butene-2 resin oil (Phillips Petroleum Co.)
 S-Oil (Monsanto Chemical Co.)
 Tackol (Monsanto Chemical Co.)
 Mineral oil, No. 511 (Texas Co.)
 Naphthenic oil, 878 AW1
 Naphthenic oil, 879 AW1
 Sun 4b Emulsifying oil (Sun Oil Co.)
 SHV20 oil (Kendall Refining Co.)
 S/V Sovaloid-N (PD-468) (Socony-Vacuum Oil Co., Inc.)
 S/V Sovaloid-C (PD-561-C) (Socony-Vacuum Oil Co., Inc.)

Group C — Asphalts and Related Materials

Asphaltum oil (Berry Asphalt Co.)
 Petrolatum, black
 Paramax (C. P. Hall Co.)
 Petropol 2138 (Pure Oil Co.)
 Stanolind asphalt No. 6 [Standard Oil Co. (Indiana)]
 Softener Type 1-80 Grade (Socony-Vacuum Oil Co., Inc.)
 Softener Type 1-90 Grade (Socony-Vacuum Oil Co., Inc.)
 Softener Type 1-110 Grade (Socony-Vacuum Oil Co., Inc.)
 Softener Type 1-120 Grade (Socony-Vacuum Oil Co., Inc.)
 Softener Type 1-130 Grade (Socony-Vacuum Oil Co., Inc.)
 Softener Type 1-Soft Grade (Socony-Vacuum Oil Co., Inc.)
 Softener Type 1-Hard Grade (Socony-Vacuum Oil Co., Inc.)
 Softener Type 2-95 Grade (Socony-Vacuum Oil Co., Inc.)
 Softener Type 2-115 Grade (Socony-Vacuum Oil Co., Inc.)
 Softener Type 3-95 Grade (Socony-Vacuum Oil Co., Inc.)
 Softener Type 3-115 Grade (Socony-Vacuum Oil Co., Inc.)
 Softener Type 4-Hard Grade (Socony-Vacuum Oil Co., Inc.)
 Softener Type 6-115 Grade (Socony-Vacuum Oil Co., Inc.)
 Paraflux (C. P. Hall Co.)
 L. W. Light Flux 1302 (Texas Co.)
 Plasticizer for synthetic rubber (Berry Asphalt Co.)
 Aro-Flux 1 (American Mineral Spirits Co.)
 Aro-Flux 2 (American Mineral Spirits Co.)
 Stanolind process compound 633½ [Standard Oil Co. (Indiana)]

Group D — Unsaturated Petroleum Derivatives

Naftolen R-100 (Wilmington Chemical Co.)
 Softener 30990-R, Oroplast L. (Oronite Chemical Co.)
 Softener 31163-R, Oroplast M. (Oronite Chemical Co.)
 Softener 30806-R, Oroplast H. (Oronite Chemical Co.)
 Dutrex No. 6 (Shell Oil Co.)

Class 12 — Pine Products

Group A — Terpenes

Dipentene
 Turpentine
 Turpentine, crude (Industrial Chemical Sales Division, West Virginia Pulp & Paper Co.)
 Terpene hydrocarbon (E. I. du Pont de Nemours & Co., Inc.)
 Tails of pinene (Garfinkel Chemical Co.)
 Terpineol, alpha (Hercules Powder Co.)
 Terpineol, extra (Hercules Powder Co.)
 Terpene hydrate (Hercules Powder Co.)
 Turpentine disulphide (Hooker Electrochemical Co.)
 Terposol 3 (Hercules Powder Co.)
 Terposol 8 (Hercules Powder Co.)

Cymene, para
 Fenchyl alcohol
 Hercosyn (Hercules Powder Co.)
 Hercosol 80 (Hercules Powder Co.)
 Pine oil, Yarnor 302 (Hercules Powder Co.)
 Pine oil, distilled

Group B — Gum Turpentine

Turpentine, crude gum
 Turpentine, crude gum, liquid portion
 Turpentine, crude gum, filter cake
 Turgum (J. M. Huber, Inc.)

Group C — Rosins

Zirex (Newport Industries)
 Maroc 6 rosin (Newport Industries)
 Benny W. resin (Newport Industries)
 Wood rosin X (Newport Industries)
 Wood rosin FF (Newport Industries)
 Abietic acid, crystals (Industrial Chemical Sales Division, West Virginia Pulp & Paper Co.)
 Staybelite resin (Hercules Powder Co.)
 Hydrogenated-dehydrogenated rosin crystals (Hercules Powder Co.)
 Mill rosin (Newport Industries)
 Bobby rosin (Newport Industries)
 Mary rosin (Newport Industries)
 Belro rosin (Hercules Powder Co.)
 Purby rosin (Newport Industries)
 Galex W-100 (Thiokol Corp.)
 Vinsol resin (Hercules Powder Co.)
 Pexite N rosin 506 (Hercules Powder Co.)
 Gum rosin N (Hercules Powder Co.)
 Gum rosin, oxidized (Eastern Regional Laboratory)
 Rosin HM-5 (G. & A. Laboratories)
 Isolene G. (G. & A. Laboratories)
 Isolene W. (G. & A. Laboratories)
 Bexin (Newport Industries)
 Dehydrogenated commercial abietic acid (Hercules Powder Co.)
 Gum rosin, non-acid portion (Eastern Regional Laboratory)
 Landora rosin (Newport Industries)
 Nuroz rosin (Newport Industries)
 Helix rosin (Newport Industries)
 Zinar (Newport Industries)
 Triangle rosin (Newport Industries)
 Munn rosin (Newport Industries)
 Solros rosin (Newport Industries)
 Zitro (Newport Industries)
 Tenex rosin (Newport Industries)
 Ester gum
 Rosin oil, natural
 Rosin oil, synthetic

Group D — Pine Tars

Pine Tar, thin (Southern Pine Chemical Co.)
 Pine Tar, medium (Southern Pine Chemical Co.)
 Pine Tar, heavy (Southern Pine Chemical Co.)
 Pine Tar, extra-heavy (Southern Pine Chemical Co.)
 Pine Tar (Tarene) (National Rosin Oil & Size Co.)
 Pine Tar, retort (Southern Pine Chemical Co.)
 Pine Tar, light (Retort Chemical Co.)

Class 13 — Resins Other Than Rosin

Bakelite 4036 (Bakelite Corp.)
 Bakelite XR-8989 (Bakelite Corp.)
 Bakelite XR-10450 (Bakelite Corp.)
 Bakelite XR-9358 (Bakelite Corp.)
 Paraplex AL-16 (Resinous Products & Chemical Co.)
 Paraplex X-100 (Resinous Products & Chemical Co.)
 Paraplex AR-148-(G-25) (Resinous Products & Chemical Co.)
 Duraplex C-50 (Resinous Products & Chemical Co.)
 Acryloid C-10-LV (Resinous Products & Chemical Co.)
 Gl tital ZV-3363 (General Electric Co.)
 Rezyl No. 40 (American Cyanamid & Chemical Co.)
 Durez 7285 (Durez Plastics & Chemical, Inc.)
 Durez 11984 (Durez Plastics & Chemical, Inc.)
 Petrex (Hercules Powder Co.)
 Piccolyte S-10 (Standard Chemical Co.)
 Piccolyte S-100 (Standard Chemical Co.)
 Pico oilproof resin, 480 (Standard Chemical Co.)
 Butvar resin, high viscosity (Monsanto Chemical Co.)
 P. E. M. Co. resin (Pittsburgh Equitable Meter Co.)
 Resin T-132 (Moore & Munger)
 Resin, Par 10 (Standard Chemical Co.)
 Resin, Par 25 (Standard Chemical Co.)
 Resin, 25° C. M.P. (Standard Chemical Co.)
 Resin, 100° C. M.P. (Standard Chemical Co.)
 Cardolite 869 (Irvington Varnish & Insulator Co.)
 Cardolite 816 (Irvington Varnish & Insulator Co.)
 Para resin 1723-2 (C. P. Hall Co.)
 Resin 480 (Standard Chemical Co.)
 Hercules Resin, 2190-26 (Hercules Powder Co.)
 Resin, benzyl chloride
 Tar resin, BC 40899 (Standard Chemical Co.)
 Tar resin, BC 40917 (Standard Chemical Co.)
 Ligno resin (Brown Co.)
 R-6-3 resin (Resinous Products & Chemical Co.)
 Guayule resin
 Gum benzoin
 Gamboge
 Shellac, clean light orange
 Shellac, machine made
 AgeRite Resin (R. T. Vanderbilt Co.)
 AgeRite Resin D (R. T. Vanderbilt Co.)
 Polystyrene-Liquid XRS-26 (Bakelite Corp.)
 Resin, RH-805 (E. I. du Pont de Nemours & Co., Inc.)
 Resin UG-5796 (United Gas Improvement Co.)
 Plyophen No. 5000 (Reichhold Chemicals, Inc.)

Class 14 — Coal Tar Products

Group A — Tars

Nevoll (Neville Co.)
 Bardol (Barrett Division, Allied Chemical & Dye Corp.)

Pictar (Standard Chemical Co.)
 Tarzac (R. T. Vanderbilt Co.)
 Tar, with chlorinated rubber (Koppers Co.)
 Tar Compound (Koppers Co.)
 Tar with P. V. C. (Koppers Co.)
 Tar 42-11 (Koppers Co.)
 B. R. V. (Barrett Division, Allied Chemical & Dye Corp.)
 Coal tar, soft
 Coal tar oil (Battelle Memorial Institute)
 Coal tar pitch
 Tarol, medium (Hercules Powder Co.)
 Resin C. pitch (Barrett Division, Allied Chemical & Dye Corp.)
 Resin C. pitch 60° (Barrett Division, Allied Chemical & Dye Corp.)
 Carbonex X Flakes (Barrett Division, Allied Chemical & Dye Corp.)
 Oil-RS (Reilly Tar & Chemical Co.)

Group B—Coumarone-Indene Resins and Oils

Bardol B (Barrett Division, Allied Chemical & Dye Corp.)
 Coumarone-indene resin (Barrett Division, Allied Chemical & Dye Corp.)
 Cumar P-25 (Barrett Division, Allied Chemical & Dye Corp.)
 Paradene 1 (Neville Co.)
 Paradene 3 (Neville Co.)
 Nevinol (Neville Co.)
 Nevindene (Neville Co.)
 Nevtext 10 (Neville Co.)
 Nevtext 90 (Neville Co.)
 Piccoumarone resin, XX-100 (Standard Chemical Co.)
 Piccoumarone resin, 1779 (Standard Chemical Co.)
 Piccoumarone resin, XX-25 (Standard Chemical Co.)
 Piccoumarone resin, 420-S (Standard Chemical Co.)
 Piccoumarone resin, 450 (Standard Chemical Co.)
 Nevillac (Neville Co.)
 Resin, R-29 (Neville Co.)
 Resin, XX-25 (Standard Chemical Co.)
 Dipolymer oil (Standard Chemical Co.)
 Refined heavy oil, No. 2 (Neville Co.)
 Dispersing oil, No. 10 (Barrett Division, Allied Chemical & Dye Corp.)

Group C—Special Oils

PHO plasticizing oil (Neville Co.)
 Nevoll (Neville Co.)
 Nevillite oil (Neville Co.)
 Akron RSO (Akron Chemical Co.)
 Reclaiming oil, Type C (Standard Chemical Co.)
 H. B. P. oil, No. 517 (Standard Chemical Co.)
 RS-3 oil (Neville Co.)

Class 15—Waxes

Yellow ceresin
 Paraffin, refined
 Beeswax, adulterated
 Japan wax
 Syncera wax
 Montan wax, crude
 Santowax O
 Carnauba wax
 Heliozone (E. I. du Pont de Nemours & Co., Inc.)

Class 16—Miscellaneous Materials

Sunaptic acid, 120-130 Sap. No. (Sun Oil Co.)
 Cardosol (Irvington Varnish & Insulator Co.)
 Cardclite 853 (Irvington Varnish & Insulator Co.)
 Pentacizer 71-16 (Heyden Chemical Co.)
 Pentacizer 180 (Heyden Chemical Co.)
 Pentacizer 188 (Heyden Chemical Co.)
 Pentacizer 131 (Heyden Chemical Co.)
 Pentacizer 176 (Heyden Chemical Co.)
 Pentacizer 279 (Heyden Chemical Co.)
 Polytac (H. Muehlestein & Co., Inc.)
 Butac (J. M. Huber, Inc.)
 Bunatak F. (Bunatak Chemical Co.)
 Bunatak R. (Bunatak Chemical Co.)
 Bunatak U. (Bunatak Chemical Co.)
 Synthol (Genseke Bros.)
 S. T. Compound (A. F. Stump, Inc.)
 SPC tackifier (Synthetic Products Co.)
 Plastac (Advance Solvents & Chemicals Corp.)
 Vistac (Advance Solvents & Chemicals Corp.)
 Mineral rubber
 Gilsonite
 Mineral rubber, pulverized
 Stearine pitch, medium
 Hardwood pitch
 Cottonseed pitch, soft
 Cottonseed pitch, medium
 Advagum 1098 (Advance Solvents & Chemicals Corp.)
 Advagum 1198 (Advance Solvents & Chemicals Corp.)
 Bunnatol G (Beacon Co.)
 Bunnatol S (Beacon Co.)
 Wool grease
 Brown grease (Swift & Co.)
 Garbage grease
 Hydrogenated tallow
 Liquid rubber
 Liquid rubber distillate
 Goldenrod rubber
 Glue, powdered (Armour & Co.)
 Glue, clean ground (Swift & Co.)
 Glue, vegetable (Arabol Mfg. Co.)
 Synprolac (Synthetic Products Co.)
 Kaylex SS (Kay & Ess Co.)
 Softener No. 20 (Witco Chemical Co.)
 B Compound (A. F. Stump, Inc.)
 Atlas G-2400 (Atlas Powder Co.)
 Atlas G-2600 (Atlas Powder Co.)
 TP-10 (Thiokol Corp.)
 Sipalin AOM (E. I. du Pont de Nemours & Co., Inc.)
 OR-11 (Dow Chemical Co.)
 Amalgamator Z-4 (H. Weber & Co.)
 Paralube (C. P. Hall Co.)
 Synpro wax (Synthetic Products Co.)
 T. A. P. S. (tert. amyl sulphide) (Standard Oil Co.)
 T. A. P. S.—Zirex (Zirex-Newport Industries)
 Styrene tar (Koppers Co.)

Polyamide A (Armour & Co.)
 Benzoic acid
 Dichlor benzoic anhydride
 Plasticizer No. 35 (Resinous Products & Chemical Co.)
 Dimethyl amide ST-1-acid (Resinous Products & Chemical Co.)
 Dimethyl stearamide
 Turpentine cresylic acid (Barrett Division, Allied Chemical & Dye Corp.)
 Carbic anhydride (Carbide & Carbon Chemicals Corp.)
 Ethyl hexoic acid (Carbide & Carbon Chemicals Corp.)
 Benzaldehyde
 Octyl aldehyde (Carbide & Carbon Chemicals Corp.)
 Cinnamaldehyde
 Chlorinated diphenyl sulphone
 Dichlor diphenyl sulphone
 Glyceryl mono chlorhydrin
 Fluorene (Koppers Co.)
 Liquid disulphide (Hooker Electrochemical Co.)
 Chlor benzyl disulphide
 Butadiene-OEI reaction product
 Cresol-acetone reaction product
 Styrene-OEI addition product
 Benzyl polysulphide
 Tetraethyl thiuram disulphide
 Phthalate-Cumar mixture (Barrett Division, Allied Chemical & Dye Corp.)
 Sorbitol tri acetal
 Sorbitol tri 2 butylidene
 Tetrahydroxy dioxan (Carbide & Carbon Chemicals Corp.)
 Octadecene nitrile
 Diethyl stearamide
 Quinitol dibutyrate
 Chlorinated lub base (Hooker Electrochemical Co.)
 Dimethyl thianthrene
 Ethylene chlorhydrin (Carbide & Carbon Chemicals Corp.)
 B. L. E. (Naugatuck Chemical Division, United States Rubber Co.)
 D. X. D. S. (Hooker Electrochemical Co.)
 Triton K-60 (Rohm & Haas)
 Benzyl mercaptan
 Kerosene disulphide
 Triacetin
 EX-104 (General Aniline & Film Corp.)
 Santicizer M-17 (Monsanto Chemical Co.)
 Santicizer E-15 (Monsanto Chemical Co.)
 Santicizer 8 (Monsanto Chemical Co.)
 Santicizer B-16 (Monsanto Chemical Co.)
 Addaplast 16 dark (Berna Laboratories)
 Addaplast 20 amber (Berna Laboratories)
 Plastoflex 10 (Advance Solvents & Chemical Corp.)
 Plastoflex 20 (Advance Solvents & Chemical Corp.)
 Piccocizer 30 (Standard Chemical Co.)
 Reogen (R. T. Vanderbilt Co.)
 Bondogen (R. T. Vanderbilt Co.)
 Plastone (Standard Chemical Co.)
 Plasticizer SC (Standard Chemical Co.)
 Hercules Plasticizer 4 (Hercules Powder Co.)
 Hercules Plasticizer 6 (Hercules Powder Co.)
 Hercules Plasticizer 7 (Hercules Powder Co.)
 Hercules Plasticizer 8 (Hercules Powder Co.)
 Plasticizer 9 (Gilbert Laboratories)
 Plasticizer 7 (Gilbert Laboratories)
 Plasticizer M-142 (Celluloid Corp.)
 Plasticizer KP-7 (Ohio Apex, Inc.)
 Plastender SD (Barrett Division, Allied Chemical & Dye Corp.)
 Plasticizer KP-77 (Ohio Apex, Inc.)
 Plasticizer 42 (Akron Chemical Co.)
 Plasticizer NTD 181.5-C (Armour & Co.)
 Plasticizer DN-2-182-C (Armour & Co.)
 Plasticizer D (General Chemical Co.)
 Plasticizer X3G-163-A (Procter & Gamble Co.)
 Plasticizer N-180-B (Armour & Co.)
 Plasticizer 16 (W. C. Hardesty Co.)
 Plasticizer 2 (Dow Chemical Co.)
 Plasticizer 5 (Dow Chemical Co.)
 Plasticizer 6 (Dow Chemical Co.)
 Plasticizer SC-2 (Standard Chemical Co.)
 Plasticizer OR-10 (Dow Chemical Co.)
 Plasticizer 8409 (H. Weber Co.)
 Plasticizer E-30 (Hooker Electrochemical Co.)
 Plasticizer E-40 (Hooker Electrochemical Co.)
 Plasticizer E-50 (Hooker Electrochemical Co.)
 Plasticizer E-60 (Hooker Electrochemical Co.)
 Plasticizer 153 (W. C. Hardesty Co.)
 Plasticizer Flexal 3GH (Carbide & Carbon Chemicals Corp.)
 Plasticizer 90-48-A (Standard Chemical Co.)
 Plasticizer A (General Dyestuff Corp.)
 Plasticizer P.V.A.-R.H.539 (E. I. du Pont de Nemours & Co., Inc.)
 Plasticizer 40-1091 (Koppers Co.)
 Plasticizer 40-1045 (Koppers Co.)
 Plasticizer Tar, No. 1342 (Texas Co.)

Rubber Sheeting Speeds Aircraft Production

The use of thin rubber sheeting in the factories of The Glenn L. Martin Co., Baltimore, Md., as a substitute for the grease formerly applied to the stretch-block in stretching operations on aircraft skins has resulted in a substantial savings in production time and stretch-block work. It has also eliminated hazards in handling stretched skin sections, reduced costs, and promoted cleanliness. Rubber sheeting in 48-inch widths and 1/32-inch in thickness is laid loosely, but evenly over the stretch-block coated lightly with machine oil. The production run of duralumin skins can be stretched without lifting the sheeting from the block. The rubber supplies a working surface on the stretch-block that slides with the work. Pits or other small defects on the stretch-block have no effect on the quality of the work because the rubber covers and compensates for such defects. It is unnecessary to polish the stretch-blocks to the high degree of smoothness essential to satisfactory stretching when grease was used as a lubricant. The use of rubber has also eliminated degreasing expense. It is no longer necessary to clean machines and tools after each shift. Because the floors are no longer slippery from the grease, employee hazards are less. Hourly production is now 150 skins in contrast to 175 skins per eight hours with the previous method.

Special Report of Office of Rubber Director on the Synthetic Rubber Program

Appendix A: Prewar Costs of Production for Plantation Rubber — I

This appendix is a condensation of a study prepared at the request of the Office of Rubber Director by Everett G. Holt, chief of the Commercial Research Division of the Rubber Development Corp. and formerly chief of the Rubber Division of the Department of Commerce. The article represents his own personal efforts in the analysis of certain data on the prewar costs of production for plantation rubber, and nothing contained herein is to be considered as reflecting the official views of the United States or any agencies thereof.

This study compiles and analyzes data bearing on the "real" costs of production, including amortization costs, for plantation rubber laid down in the New York market, and indicates the probable percentages of total capacity that have been produced at various cost levels, for representative prewar years.

The approach to this problem is intentionally objective and empirical, more concerned with practical than with accountants' results, but considerate of both. Long-term data are used to indicate trends. Short-term data are used in connection with "fixed date" cost situations and to corroborate and amplify long-term data. The data included in the study are all believed to have satisfactory evidential value, even though not in any one case, nor for any one year, fully comprehensive.

The period selected starts with 1913, and covers the 30 years since production of plantation rubber first exceeded the output of wild rubber in 1912. This period includes World War I, the post-war trade boom of 1919, the short, but severe depression of 1920-1921, the British Rubber Restriction Era of 1922-1928, the world trade depression of 1929-1933, the International Rubber Regulation period of 1934-1941, and World War II to the end of 1942. Wars, trade booms, trade depressions, depreciation of currencies, industry regimentation, and internationalisms have all participated in shaping the trend of rubber prices, which, as will be demonstrated, have not been without influence on costs of rubber production.

Wholesale Rubber Prices—New York Market

Taken over a period of years, dealers' selling prices for rubber in secondary markets (markets in rubber-importing countries) average higher than any other wholesale prices for rubber. Such prices include dealers' handling costs and profits in addition to laid-down costs at ports of entry.

These wholesale prices are therefore higher than the prices received by plantations, on the average, although an individual plantation might get better than average prices on its sales in any year. In a broad sense, the prices in secondary markets represent the level below which the average manufacturer was unable to purchase rubber, and above that at which the average producer was able to sell rubber.

The prices at which rubber has sold in the New York market have closely reflected

dealers' wholesale prices in London, the principal other secondary market. International arbitrage usually kept the rubber prices well in line, as the commodity entered both the United States and the United Kingdom free of import duty. New York quotations are therefore representative.

The grade for which prices are quoted below is "plantation ribbed smoked sheets", prices for which are above the average for all grades of rubber. The prices represent daily quotations averaged for annual periods, as reported by the United States Bureau of Labor Statistics. Quotations are in United States currency.

TABLE 1. NEW YORK WHOLESALE RUBBER PRICES, 1913-1942—CENTS PER POUND

1913	82.0	1929	20.6
1914	65.3	1930	11.94
1915	65.7	1931	6.20
1916	72.5	1932	3.47
1917	72.2	1933-32	28.17
1918	60.2	1933	5.95
1919	48.5	1934	12.93
1920	35.9	1935	12.37
1921	16.5	1936	16.51
1922	17.3	1937	19.42
1913-22	53.61	1938	14.70
1923	30.7	1939	17.91
1924	26.4	1940	20.24
1925	73.0	1941	22.34
1926	48.7	1942	22.50
1927	38.1	1933-42	16.49
1928	22.6		

The average price at which consumers of plantation rubber bought from dealers in New York declined from 53.6¢ per pound in the 10 years ended 1922 to 28.2¢ in the next decade, and to 16.5¢ in 1933-1942. During 1930-1939, the average price was 12.14¢ per pound, the lowest for any 10-year period.

The producers of plantation rubber who stayed in business had to and did live within the income derived from sales of rubber at average annual prices somewhat below those quoted above, and few rubber plantations went out of business.

During World War I the price of rubber was high, but price was lower in 1918 than for any previous year, and after the war ended the decline continued and became accentuated after the 1919 postwar boom. From 1917 to 1921 the annual price average declined from 72.2¢ to 16.5¢ or 77% at the 1921 low point.

Since 1922, rubber trading has been free of the effects of government control over production only in 1929-1933; the average market price during that five-year period was 9.63¢ per pound, the annual price declining from 20.6¢ in 1929 to a low of 3.47¢ in 1932, or 83%.

Rubber prices during World War II have been higher than in years preceding this war, when International Rubber Regulation was also in effect. The overall trend from 1939 through 1942 is roughly comparable to the trend from 1914 through 1917.

United States Rubber Imports—Unit Values

The official statistics of the U. S. Department of Commerce covering rubber imports provide another series of statistics covering every year of the period under

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study. The imports are reported by quantity in pounds and value in dollars. Under the customs regulations, importers of rubber are required to declare the c.i.f. cost of imports. Experience with these statistics for many years has convinced the writer that the declared values reflect importers' average laid-down costs accurately.

The rubber imported into the United States represented about 45% of world production prior to World War I, then increased until it amounted to about 70% of world production in the first half of the 1920's, and thereafter gradually took less and less of world output until it accounted for about 50% in years preceding World War II. These imports came from all parts of the world, but the rubber was preponderantly of Far East origin over the period under discussion.

United States rubber imports for annual periods are therefore representative, from the standpoint of price, of the cost prices paid by importers throughout the world, plus insurance and freight to the United States.

The import statistics cover all grades and types of rubber, and the declared values would be expected to average somewhat lower than New York market prices for plantation ribbed smoked sheets because of inclusion of all the lower grades as well as because of the domestic trading costs and profits involved in the market prices.

TABLE 2. U. S. RUBBER IMPORT VALUES, 1913-1942—CENTS PER POUND

1913	65.38	1928	25.04
1914	49.03	1929	19.08
1915	49.67	1930	12.91
1916	58.85	1931	6.57
1917	57.18	1932	3.50
1918	44.84	1933-32	25.54
1919	40.17	1933	4.89
1920	42.79	1934	9.80
1921	17.77	1935	11.39
1922	15.10	1936	14.93
1913-22	44.08	1937	18.46
1923	26.68	1938	14.10
1924	23.69	1939	15.96
1925	48.11	1940	17.37
1926	54.34	1941	18.18
1927	35.46	1942	18.94
		1933-42	14.40

Some of the rubber was imported by manufacturers who bought it in foreign markets, but in this business they were in effect competing with rubber dealers. Some of the imported rubber came from plantations owned by the manufacturers, but this never represented a large per cent. of the total, and the value reported for such imports were not such as to affect validity of overall trends shown by the statistics.

These import values come closer to representing the prices received by producers, in terms of United States currency, than the New York market quotations in Table 1. There was an average spread of 9.5¢ per pound between import values and market prices in the decade ended 1922, 2.6¢ in the decade ended 1932, and 2.1¢ in the

decade ended 1942. The volume of imports increased tremendously, and as volume increased, dealers' profit margins logically enough declined. The lowest spread for a 10-year period was 0.89¢ for 1930-1939, when the unit value of imports averaged only 11.25¢.

However, comparison of Table 2 with Table 1 shows that in several years the unit value of imports exceeded the New York market price. This was first the case in 1920 and 1921, next in 1926, next in 1928, and finally in 1930, 1931 and 1932. This phenomenon has always occurred in periods when price was declining and is the result principally of two factors. First of these is the practice of making forward contracts (many months or at times over a year in advance of shipment), and second is the customary time lag between date even of spot purchases in the Far East and date of entry into the United States (often several months).

When these factors both operate in the last half of a year of rising market prices as in 1925, and this is followed by a year of declining market prices as in 1926, there may even be a sharp rise in the import unit value when the market price shows a sharp decline; this is the extreme instance.

A ceiling above the average selling prices of rubber producers is represented by the unit values, since they usually included costs and profits of intermediate dealers and brokers, plus overseas freight and insurance charges. That the rubber producers as a whole were able to remain in existence during 1931-1934 when the import value of rubber averaged only 6.2¢ for the four years is a remarkable achievement and presents strong evidence as to the competition of which they may be capable in future.

This achievement is particularly noteworthy when considered in connection with the declining import values of the four preceding years, from 35.5¢ in 1927 to 12.9¢ in 1930. It might have been thought that effects would have been sufficiently drastic to have exhausted accumulated reserves with which producing companies were strongly entrenched toward the close of the 1922-1928 period of British Rubber Restriction.

Costs for Estates, 1919-1922

British Rubber Restriction in the 1920's and International Rubber Regulation in the 1930's were fostered by the interests concerned with large estates in British Malaya and the Netherlands Indies. Information on estate production costs in these areas will be most indicative. The 1943 basic quotas of these two countries under the International Rubber Regulation Agreement accounted for 80% of the total basic quota of the Far East as a whole (including Indo-China at 60,000 tons), hence their interests are representative as well as dominant.

Exact and comparable figures on costs of production have seldom been publicly available for large groups of rubber plantation companies. The U. S. Department of Commerce, in "Plantation Rubber Industry in the Middle East" (Figart, 1925), devoted over 25 pages to analysis of records for years 1919 through 1922. On page 71, the "estate expenditure per pound of rubber," expressed in British currency (pence per pound), was estimated for various groups of companies.

"Estate expenditure" as used there was stated to include all expenditures on (1) Upkeep of producing area, (2) Tapping and collection, (3) Preparation of rubber for shipment, (4) Packing and shipping charges to local ports, (5) General charges (superintendence, maintenance of buildings, hospitals, etc.), and (6) Local taxes. The

result was not an f. o. b. cost, for which depreciation of buildings and machinery would customarily be added, according to that report.

Total all-in cost would, in addition, have included (1) Commission to staff, (2) Freight and insurance to London (3) London administration charges, and (4) Corporation and income taxes—in the case of a sterling company.

TABLE 3. ESTATE EXPENDITURE PER POUND OF RUBBER, 1919-1922, PENCE PER POUND

	1919	1920	1921	1922
27 Malaya, sterling companies	10.6	11.4	9.8	6.7
19 Malaya, dollar companies	9.4	10.5	8.4	5.9
49 Java, estates	10.6	11.5	8.2	5.6
11 Sumatra, estates	10.0	14.0	12.0	7.2
13 Ceylon, sterling estates	11.7	13.7	7.4	6.0
10 Ceylon, rupee companies	9.5	11.8	4.8	4.6
Average per pound, pence	10.6	12.2	9.6	6.4
Average per pound, U.S. cents	19.5	18.6	15.4	11.8

Source: "Plantation Rubber Industry in the Middle East", p. 71.

See Table 20 for conversion rate.

It should be noted particularly that the Malayan dollar and Ceylon rupee companies had lower costs than sterling companies in these British possessions.

The same report by Figart shows a further compilation from "a booklet issued by a London firm" in which an attempt was made to arrive at actual all-in costs, as described in the following quotation:

"The term 'all-in costs' in the sense which we have used it, comprises all estate expenditure (other than capital expenditure), staff bonuses, depreciation allowance for buildings and machinery, freight to London or New York, marine insurance, dock charges, and brokers' and agents' commissions, as well as directors' fees and cost of London office administration. In some cases where we have been obliged to estimate one or more of these items our all-in figures may differ from those quoted in the company's annual report. It should be stated, too, that in arriving at the profit for the year we have deducted interest on loans, debenture interest, foreign income tax, and (if known) British corporation tax, but not British income tax or excess-profits duty."

TABLE 4. ALL-IN PRODUCTION COSTS OF STERLING COMPANIES, 1919-1922

	1919	1920	1921	1922
Companies	Pence per Pound	Pence per Pound	Pence per Pound	Pence per Pound
Malaya	64 13.12	64 14.48	64 10.70	60 8.43
Java	8 13.74	8 16.04	8 13.39	8 10.23
Sumatra	10 16.24	10 17.89	10 14.28	10 9.42
Ceylon	12 14.59	14 16.49	13 8.65	13 7.46
Other	22 17.28	22 16.37	22 12.97	21 9.22
Average un-weighted	14.99	16.25	12.00	8.95
U. S. cents	27.62	24.81	19.25	16.50

Source: "Plantation Rubber Industry in Middle East", p. 75.

See Table 20 for conversion rate.

The plantation rubber industry never had to worry much about its cost of production until after World War I, and extravagances of the postwar boom of 1919 were reflected in higher pence costs in 1920 than in 1919, although lower cents cost after conversion at Table 20 exchange rates.

Retrenchment was rapid from 1920 through 1922 in all countries, and in 1922, according to the table above, Malaya and Ceylon were showing the lowest all-in costs. The data for other countries was less inclusive than for Malaya, but the general uniformity of trend affords evidence that they were reasonably representative and constitute a suitable background for the

following section.

It is noteworthy that, comparing table averages shown in Table 4 with those shown in Table 3, the all-in costs were much more in excess of estate expenditures in 1919 and 1920 than in 1921 and 1922; economies in overhead costs paralleled those in estate expenditures at the time.

Cost Trend for Malayan Estates 1921-1933

That costs of rubber production on plantations declined sharply during 1921 and 1922 has been demonstrated. Whether the economies made effective at that time were temporary or permanent is the next point for consideration.

The method usually approved by those calculating costs of rubber production for estates was to adopt an accounting formula or classification of expenses, ascertain costs under each item, and add the items. Comprehensive primary itemized records necessary for such a study are not available.

Some years ago the writer made summary calculations from reports of plantation companies published in Rickinson's "Rubber Companies Position." The analysis covered 79 identical Malayan sterling estates from 1921 to 1929 inclusive, 85 in 1930 and 1931, 83 in 1932, and 79 in 1933. The results were published in "Rubber News Letter", Circular 3546, U. S. Department of Commerce, October 30, 1934.

The method used was to tabulate the annual rubber output in pounds, the income realized (total pounds sterling from all sources and pence per pound), the reported all-in cost (total and per pound), the revenue distributed through dividends, reserves and "carried forward," and then calculate the "over-all out-of-pocket expense" per pound of rubber for the entire group of companies for each year in British currency.

This method did not exclude the appreciable influence of earnings or losses from other sources than rubber in the case of the companies included. It did not exclude the influence of capital expenditures. Stocks of rubber held by producers at the end of their financial years were customarily included in their accounts at actual cost of production.

It is believed that the results approximate the average net cost of production of these estates per pound of rubber for the years covered and that confidence can be placed in the general accuracy of cost trends indicated by the following table. The average price realized per pound (for all grades), and the average London market price (for ribbed smoked sheets) is also shown. The cost of production was calculated in pence, but in Table 5 is also shown converted to U. S. cents on the basis of Federal Reserve average annual exchange rates.

TABLE 5. MALAYAN ESTATES COST OF PRODUCTION TREND, 1921-1933

	Malayan Estates			London Market Average
	Approximate Net Cost of Production Cents	Net Pence	Average Sales Price Pence	Price R. S. Sheets Pence
1921	19.61	12.23	12.26	9.56
1922	15.29	8.29	11.18	9.13
1923	18.14	9.52	13.33	15.31
1924	16.70	9.08	14.34	13.88
1925	17.05	8.48	25.99	35.06
1926	19.83	9.86	23.82	23.75
1927	20.88	10.30	18.10	18.44
1928	17.05	8.41	11.90	10.69
1929	12.69	6.28	9.72	10.25
1930	10.17	5.02	5.02	5.91
1931	5.61	2.97	2.99	3.13
1932	3.61	2.47	2.41	2.44
1933	4.34	2.46	2.90	3.25

Source: Rubber News Letter, Circular 3546, U. S. Dept. of Commerce. Reference may be made to Table 20 for conversion rates to U. S. cents.

The costs in pence shown in Table 5 for 1921 and 1922 are roughly comparable both in amount and trend to those shown for Malayan companies, and the average for all companies, in Table 4.

Expenses were pruned drastically in 1922 compared with 1921. In 1921 restriction of production by voluntary agreement had affected the outputs of numerous companies and retarded cost reductions.

The British Rubber Restriction Scheme was introduced November 1, 1922, and prices quickly rose, but in the main the economies instituted by rubber producing companies in 1921 and 1922 were continued thereafter and became permanent. Restriction at first brought only slight increased operating costs per pound of rubber, as overhead costs were spread over a restricted poundage.

Following the abnormal high prices of 1925-1926, there was temporary increase in expenditure, owing partly to greater liberality in bonuses to estate managers and staff and partly to increased wages, ocean freight, brokerage fees, directors' fees, etc.

In 1928 abandonment of restriction effective November 1 having been announced early in the year, expenses came down notably on a growing, but still curtailed output and with wages unreduced; in 1929 full outputs brought still further reduction to a new low record of costs, well below that of 1922, 1925, and 1928.

From 1928 through 1933, Table 5 indicates that each successive year saw a new low record of pence costs of production, in response to the pressure from extremely low market prices. Since, in the vicissitudes of depression in 1920-1921, estates learned methods of saving that stayed in effect through the period of British Restriction despite curtailed outputs, it is similarly to be expected that important economies instituted in the 1928-1933 period likewise became permanent.

Without any intention of minimizing the serious difficulties which the rubber estates, in common with all agriculture and in fact all industry, encountered during the depression of 1929-1933, the indicated quartering of the 1927 cost of production in 1932 and 1933 is, in itself, evidence that concepts previously held concerning rubber production costs became subject to review from that time on.

The reduced costs that would have permanent effect arose out of improved tapping methods, better utilization of labor, reduced expenses for upkeep of planted areas, higher yields from improved trees, and other factors to a large extent independent of the depression. On the other hand it is to be expected that expenditures for staff and labor were subsequently raised to a proper level and that increases occurred during the subsequent period of International Rubber Regulation in directors' and agents' fees, freight rates, etc.

The statistics on cost of production presented above constitute a conclusive demonstration of the fact that cost of production is not a static figure, but a dynamic one that has changed constantly with conditions, with a long-term downward trend to the end of 1933.

British Sources on Costs, 1929-1935

Corroboration of the representative character of the cost estimates in Table 5 is to be found in statements from British sources. The following statement made over the British Broadcasting System supports the general accuracy of the estimates from 1929 through 1933. The statement was made by Mr. J. W. F. Rowe, whose earlier study in "Artificial Control of Raw

Materials Supplies—Rubber" issued March, 1931, under the auspices of the London and Cambridge Economic Service of the London School of Economics, has general respect and entitles his testimony to consideration. The broadcast was made February 7, 1935. He stated:

"In 1929 occurred the discovery that the average costs of estate production in Malaya were less than had been generally supposed. During the six years of restriction, the trees had not only had a good deal of rest from tapping, but they had been better cared for, and the methods of cultivation had been much improved, while better and cheaper systems of tapping had also been discovered. The effect on costs had been concealed while restriction was still in force, but when full production was resumed, it was realized that the total costs of production on average estates were between 6 and 7 pence a pound, and that therefore a price of only 9-10 pence would suffice to give reasonable profits instead of the 1/ (shilling) which had been considered as an absolute minimum.

"World production in 1932 was roughly 150,000 tons less than in 1929, and the price in 1932 averaged 2½ pence per pound, as compared with 10¼ pence in 1929. Seeing that the 1929 price was not specially profitable, one is really inclined at first sight to wonder that anything at all was produced at this 1932 price. Actually, estates in Malaya as a whole produced at about the same rate as in 1929, while the Dutch estates showed an even higher production in 1931, and about the same in 1932.

"It seems simply incredible perhaps, but the whole level of the 1929 costs of production was rapidly scaled down in three main ways. First of all, there were terrific reductions in salaries and wages. Secondly, all but absolutely essential maintenance and cultivation work was given up and the number of men was reduced to a minimum. Thirdly, efficiency in general was increased under the spur of necessity, and certain newly discovered methods were introduced.

"It must be explained, however, that while some estates which could afford it, restricted their output as the price fell in order to conserve their bark against the time when tapping would be more profitable, other estates were driven to tap more severely than is normally desirable, in order to obtain the largest possible output over which to spread their overhead costs, and it was as the result of this balance that the total output of estates showed little change.

"By the end of 1932 a majority of Malayan companies had got their costs down to 3 pence a pound or even lower. But you must understand that this would not include proper allowance for maintenance or depreciation, while it must be remembered that salaries and wages are at a bare subsistence level. In other words, such low costs cannot be regarded as a new level of proper normal costs. They represent rather costs of production in an emergency, and as such they can be maintained for perhaps two or three years, but not in the long run. Nevertheless, from the point of view of the companies this reduction of costs is a very fine achievement.

"But I must bring out the other side of the picture. Hundreds of British assistants and assistant managers have had to be sacked, and thousands of wage earners have been returned to India, their contracts cancelled. Those who remained at work were earning, at the end of 1932, rather less than half of what they were earning in 1929. The return of these laborers to their homes in Southern India means for them a poor subsistence level. The lot of the assistant managers has in a way been even worse. Most of them stayed in Malaya living on their savings and hoping to find a job.

When their savings were exhausted, they had to fall back on what amounts to Poor Law Relief from the F. M. S. Government. Thus the reduction of costs is, as I have said, a fine achievement from one point of view, but the heavy price in human suffering must not be overlooked."

A Mincing Lane (London) firm which analyzed the results of 89 rubber producing companies for their financial years ending December 31, 1931, provides further material for that year. It was found that for 16 companies the records were complicated by the inclusion of other produce such as tea, coffee, and cocoa; they were therefore excluded. A further 15 companies failed to state their selling price and were also excluded. Of the remaining 58 companies 51, which produced 21,385 tons of rubber, suffered losses; while 7, which produced 2,914 tons, made profits by virtue of favorable forward sales. The average 1931 cost of production for the 58 companies was 4.10 pence per pound according to this analysis. This, it will be noted, is considerably higher than the cost stated for 1931 in Table 5, but shows plenty of reduction under the preceding years. The 58 companies included 37 in Malaya, 16 in Ceylon, and 5 in the Netherlands Indies. It was stated in the *India Rubber Journal* (May 28, 1932) account of this analysis that many of the planting companies received considerable sums in interest on holdings of securities and that this revenue from non-estate sources was not deducted in making the calculations—hence real costs were considered somewhat higher than the 4.10 pence calculated.

Some indication of the approximate costs of production on Malayan estates subsequent to 1933 is to be found in published correspondence between the government of the Federated Malay States and the Rubber Growers Association. The Acting Chief Secretary to Government, F. M. S., in letter of May 2, 1935, stated:

"Dividends are now the rule instead of the exception, not large perhaps, but they will increase as the price of rubber rises."

This statement should be considered in comparison with the London market price average for ribbed smoked sheets at 6½ pence for 1934, with the average New York price for ribbed smoked sheets at 12.93¢ for 1934 and with the average declared value per pound of U. S. rubber imports at 9.80¢ for 1934. The letter also quoted the report of the Planter's Association of Malaya for 1934:

"A moderate degree of prosperity has been restored to an industry which for years had struggled on the verge of insolvency."

In a further letter of the F. M. S. Government to the Rubber Growers Association on March 18, 1936, the results of official analysis of detailed figures for 70 Malayan estates covering 1935 included the following:

"The figures for the sterling companies . . . fall into two groups, for which the average percentages of government charges to profits (the calculation being based on an average selling price of 5.9 pence per pound) were respectively 26¼% and 22%.

"The profits referred to are not the profits as normally understood, but the profits that would have accrued had no government charges been levied. . . . In respect to two companies in the first group the relation between government charges and profits exceeded 50%. In one of these, however, the directors' fees were 2¼ times the duty and nearly ¾ of the rent, the staff bonus and commission equalled the duty, and the f.o.b. cost (exclusive of quit rent) was .47 pence per pound above the average. In the other case the directors' fees were 1¾ times the duty and staff bonus 1¼ths of

the duty. Furthermore, only 64% of the area is planted and the incidence of quit rent in relation to profit is, therefore, higher.

"In the second group in one instance the government levy was 59.4% of the profits. In that case, the London administration charges were 1½ times the duty, and the directors' fees were twice the duty, and the f.o.b. cost (exclusive of quit rent) was 0.61 pence per pound above the average. It will be appreciated that a reduction in these items to what might be regarded as more normal proportions would have a considerable effect on the relation between government charges and profits.

"... Of 17 local estates (Straits currency companies) the average percentage of government charges to profits was 21.17. It should be mentioned that these estates on the average pay much higher rentals than those in the sterling group."

These quotations show that sterling estates were paying worthwhile dividends even in 1936, with an average 1935 selling price of 5.9 pence per pound. They are of interest in pointing out the exceptionally heavy London charges in the case of occasional companies. Also, they indicate that costs of large sterling estates were higher than costs of Straits companies although the latter paid higher quit rents. These quotations are from supplement to the *Bulletin of the Rubber Growers Association* entitled "Taxation of the Rubber Industry in Malaya."

Costs on Dutch Estates

Long-term data on the average cost of production on estates in the Netherlands Indies has not been located, but the writer, in Department of Commerce, "Rubber News Letter" Circular 3574, May 25, 1935, made the following statement based on analysis of an article published in *De Knack* (Amsterdam) March 1, 1935, which included statistics from which the conclusions were drawn:

"The average cost of production is not shown in the article. Separate data is given on the individual companies showing wide variation in what is included in costs, and stating the production, and reported cost per half kilo of rubber for various companies, for the last three years. Analysis of this data would indicate, for 41 companies, an average cost of 17.15 guilder cents per pound for 1931, 12.05 for 1932, and 10.51 for 1933, but these averages are perhaps to be taken with considerable reserve; they are, however, indicative of trend during the period."

Converted to United States currency at Federal Reserve average annual exchange rates, these guilder estate costs compare as follows with the Malayan estate costs in Table 5, in U. S. cents per pound.

TABLE 6. MALAYAN AND DUTCH ESTATE COSTS, 1931-1933

	[U. S. Cents per Pound]	
	Malayan	Dutch
1931	5.61	6.90
1932	3.61	4.85
1933	4.34	4.24

Considering the wide fluctuations in exchange rates during this period, the comparison is remarkably close and rather conclusively demonstrates that economies adopted in Malaya were applied more or less equally in the Netherlands Indies. The trend of Dutch estate production costs was therefore probably similar to that of Malayan estates from 1922 onwards, and in other countries the results cannot have been far different.

The averaged costs shown in Tables 5 and 6 are designed to show the trend of

estate production costs and their variance under different circumstances over the period. For some companies the figures represent the equivalent of all-in costs; for others, who sold in primary markets, they represent f.o.b. costs at ports in the Far East. It needs particularly to be borne in mind that averages do not reveal the range of costs for the individual estates, although as much rubber was produced below average costs as above average costs.

"Costs" of Native Rubber Producers

While on the subject of costs in the Netherlands Indies, data bearing on "costs" of native rubber producers is worth recording. "Costs" in this sense means the prices which caused natives to sell their rubber locally to exporters or remilling factories.

When International Rubber Regulation became effective June 1, 1934, no means existed for the application of a system of restriction by means of individual assessments of production capacity and issue of coupons or rights to export to the individual Dutch native producers. The original quota for the Netherlands Indies was so low, however, that it was necessary to restrict severely the exports of native rubber. This the government undertook to accomplish through a special export tax which did not apply to the exports of estate rubber and proceeds of which did not go into general revenue, but were to be used in native areas on projects considered beneficial to the native population.

The regular export tax on native rubber was 5% ad valorem, and this continued in effect. During part (at least) of the seven months of regulation in 1934, the additional special export tax was at the rate of 10 guilder cents per kilogram. The rate was increased frequently during 1935 and 1936, an incomplete table of the changes being as follows:

TABLE 7. DUTCH NATIVE RUBBER SPECIAL EXPORT TAX RATES, 1935-1936

[Guilder Cents per Kilogram]	
Date—1935:	Cents
January 1	16
June 1	18
June 16	22
June 30	21
July 22	20
September 30	22
October 13	23
October 18	24
October 23	25
October 30	26
November 11	29
Date—1936:	Cents
January 1	30
February 12	32
July 2	36
August 2	37
September 30	47
October 1	48
October 4	50
October 8	51
October 11	48

With numerous increases in November-December.

The American Trade Commissioner at Batavia reported that from the inception of the special export tax to the end of 1936, the government collected no less than 85,097,000 guilders from this source. (Commerce Department, Rubber Circular 3640, April 30, 1937.)

A spokesman for the Netherlands Indies government in the course of Volksraad debate in 1936 on income derived by natives from sale of their rubber is the source of the following statistics representing exports in terms of dry rubber, metric tons, and the "properly estimated" income derived by the natives annually from 1931 through 1936, figures for the last year being based on results for the first six months of that year. The price calculations represent the effect of conversion of the guilder at Federal Reserve average annual exchange rates.

TABLE 8. INCOME OF DUTCH NATIVES FROM RUBBER, 1931-1936

	Netherlands Government Estimates		Calculated Income	
	Exports Metric Tons	Millions of Guilders	Guilder Cents per Kilogram	U. S. Cents per Pound
1931	89,000	13.7	15.40	2.80
1932	61,000	4.1	6.72	1.23
1933	116,000	12.5	10.77	2.53
1934	144,000	16.6	11.53	3.52
1935	145,000	17.6	12.24	3.76
1936	153,000	20.0	13.07	3.82

That the government spokesman was estimating income rather high was the tenor of remarks from the opposition during the debate, but accepting these estimates at face value, Dutch native producers received less than 4¢ U. S. per pound for their output during each of six years in succession.

The table shows that production was restricted very severely by the extremely low price equivalent to 1.23¢ U. S. per pound in 1932, and considering that the 1937 output (following general introduction of an individual restriction system for the natives on January 1) amounted to 205,989 long tons, it is apparent that the 1936 price continued sharply restrictive.

These facts are believed to warrant an estimate that the amount of Dutch native rubber produced would increase greatly at rising price levels—that at a local sales price of 1¢ U. S. per pound production would continue to some extent, that at 4¢ the production would be three to four times greater and that at about 7¢ production would approximate labor capacity, if exports were not restricted and were free of tax. This range of selling prices would be comparable with f.o.b. costs for estates, not all-in costs, for which in some cases remilling costs and in all cases costs of ocean freight and insurance would be added.

Taken in conjunction with the amount of the special export tax reported by the American Trade Commissioner and allowing also for the 5% ad valorem regular export tax on native rubber, the export taxes appear to have accounted for fully two-thirds the value of the Dutch native rubber exported during the first two years and seven months of International Rubber Regulation. In the closing months of 1936, taxes accounted for over 85% of the total value of the rubber exports by Dutch natives.

In the course of a "Memorandum on Rubber Supplies to the U. S. A. over the Years 1940/41" prepared by Sir John Hay and issued by the I.R.R.C. in October, 1943, in rebuttal of testimony before the Truman Committee, there was included the following paragraph bearing on costs of native rubber from British Malaya, delivered at New York.

"In the course of evidence before the Truman Committee, it was stated that 'the natural rubber produced certainly did not cost more than 5¢ on the average'; and by way of amplification, it was further stated that 'the native plantations would continue to produce rubber down to about 2¼ or 3¢ (U. S.) a pound.' Since these figures were directly contrasted with the price charged for rubber landed in America, it must be presumed that the cost figure was meant to include insurance, freight, and the charges for selling which fall on the producer. In 1941 the actual cost of these items, plus export duty which had long been imposed by the governments of Malaya for revenue purposes, was equivalent to 2¼ dollar cents (U. S.) per pound. Moreover, before it can be made fit for export markets, the bulk of the rubber which comes from what are termed 'native plantations'

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EDITORIALS

What Price International Agreements on Rubber?

THERE is some reason to believe that the "informal" discussions between representatives of the English, Netherlands, and United States governments held in London during the first part of August may have resulted in something more than "an agreement on limited objectives concerned only with the short position between now and the time the rubber producing areas of the Far East are liberated," as reported by our State Department following this conference. A signed article in the *New York Herald Tribune* for October 28 revealed that as a result of agreements already reached between these three governments, technicians and equipment to be used in reclaiming and restoring to full production the plantations in the Far Eastern area have already been sent to the South Pacific. Although the immediate reason for this action is indicated as being the need to add to the supplies of natural rubber required for military tires and other equipment at the earliest possible moment, there has been some reaction as to just how far these agreements already decided upon go, and just what effect they will have on the early postwar future of the production of synthetic rubber in this country.

In a surprise announcement made late in October the Defense Plants Corp. listed many government-built plants, including the synthetic rubber plants, as potential surplus for disposal as soon as they were not required for the war effort. A spokesman for this government agency stated that the plants were not to be considered as "on-the-market" now, but that the purpose of the listing was simply to let the public know what is on hand and what may some time in the future be available for purchase or lease. In spite of this statement, if it is considered together with the recent revelations regarding international collaboration in preparing for the rehabilitation of the plantations in the Far East, one might get the impression that an increasing amount of emphasis is now being directed toward the production of natural instead of synthetic rubber, at least as far as government policy is concerned.

In discussing the protection of U. S. consumers from combinations of foreign producers, the Tariff Commission's report on "Rubber" made public early in October states that conditions might develop under which consumers would be no better off than they would have been had no domestic industry come into existence, as for example, if the prices obtained under an international rubber control scheme to which the United States was a party were higher than would have prevailed if practically all of our rubber requirements had to be procured from foreign suppliers acting in combination to control prices. It is certainly hoped that the rubber industry in the United

States would not permit such a condition to exist for any length of time, but the Tariff Commission apparently thinks that even with the danger of the development of such a condition inherent in any international agreement, there is more to be said for such agreements than against them.

"Actually, in view of the great overcapacity that will exist in the world's rubber industry at the close of the war, at least a temporary international rubber agreement which would include the United States might well be justified, if arrived at under governmental auspices and if accompanied by safeguards to insure that it will benefit the American people as a whole and assist, rather than retard, world economic advancement," the report states.

The future progress of the rubber industry in the United States and the future policy of our government regarding rubber and products made from it as articles of both national and international trade will undoubtedly be decided to a considerable extent by happenings of the next twelve or eighteen months. The progress of our national program for the development of a United States synthetic rubber industry was quite frequently and quite completely covered by progress reports and special reports from the Office of the Rubber Director during the last two years, and progress and policy regarding the development of international agreements on rubber should also be reported promptly and fully. Rubber is no longer only big business and government business, but it is now definitely public business, and the public wants to know before any commitments are made with other nations not only what these commitments are, but that they will not interfere with the maintenance in this country of ample capacity for the production of synthetic rubber to provide adequate supplies for any future emergency. We have paid a rather high price for our lack of preparedness in 1941, and it was only by virtue of a substantial, though still too small, stockpile and the almost superhuman efforts of our engineers and chemists in building a synthetic rubber industry of 800,000 long tons yearly capacity in the short time of two years, that we have achieved actual self-sufficiency in rubber for the first time. As time goes on, the importance of the achievements of the last two or three years may soon appear to be of less and less significance in contrast with the future problems of stabilizing world markets. There is one fact, that of military security in rubber, which must never be lost sight of, and although both government and industry are in general agreed upon the necessity of the action to be taken, it cannot be re-emphasized too often.

No matter what happens, there must be maintained in this country and in production according to the best scientific and technical knowledge at the time sufficient capacity for synthetic rubber to provide for military requirements, whether this production is at a cost higher than rubber could be obtained from outside sources or not. All other U. S. requirements should then be supplied from an open market in which domestic and foreign producers are in actual competition.

Scientific and Technical Activities

Standard Oil Development Co. Forum on Industrial Research

THE Standard Oil Development Co., central research organization of Standard Oil of New Jersey, celebrated its twenty-fifth anniversary by sponsoring a one-day forum on "The Future of Industrial Research", at the Waldorf-Astoria Hotel, New York, N. Y., October 5. More than 500 industrial scientists, educators, government leaders, and business men especially interested in research attended the meeting. Frank A. Howard, retiring president of Standard Oil Development, welcomed the guests and introduced Charles F. Kettering, director of research for General Motors Corp., who acted as chairman of the morning session. This session was devoted to a consideration of the question: "What should be the guiding principles and objectives for the commercial programs of industrial research and development organizations?" Warren K. Lewis, professor of chemical engineering, Massachusetts Institute of Technology, was chairman of the afternoon session, which discussed the question: "How can small business serve itself and be served by industrial research and development?" Bradley Dewey, president of Dewey & Almy Chemical Co. and former Rubber Director, was the speaker at luncheon. At dinner, Robert P. Patterson, Under-Secretary of War, was the principal speaker.

The Morning Session

The first speaker at the morning session was Frank B. Jewett, retiring vice president of the American Telephone & Telegraph Co. in charge of development and research and former chairman of the board, Bell Telephone Laboratories, Inc. Dr. Jewett spoke on "The Future of Industrial Research—The Physicist's View". He first pointed out that in the industrial field the place of chemistry and physics and of men widely trained in them has become firmly established during the past two or three decades.

"No applied science industry can now be secure or hope to grow without them," he said. "This is because exact knowledge of the fundamental sciences and of the methods by which it is derived provides the holders of it with powerful facile tools with which to fashion new things of utility. Industrial research organizations seem certain to grow both in number, in size and in diversity of fields covered and to play an increasingly dominant part in determining our economic and so our political future," he added.

The problems and functions of the research organizations of both large and small companies as well as those of cooperative research and development organizations were described. All of these types of organizations are parts, essentially, of a free economy system where initiation and operation are wholly in the hands of private management, and the speaker said that he personally was strongly convinced that they are the preferred methods for insuring maximum benefit not only to industry, but to the nation as well. In the fields of agriculture and public health, active participation of political government, either state or national, was considered necessary in order to obtain maximum benefits of scientific knowledge to the nation, but the great objection to delegating to political government control of much of industrial research was found in the fact

that government is necessarily political, i.e., motivated by the resultant of many forces which must often be compromised if anything is to be accomplished. This is a setting in which a large number of the best of our scientific and technical men are reluctant to operate, it was said.

Dr. Jewett criticized any further intrusion of government into the control of industrial research as based either on misconceptions; on real reasons that are masked; or on a desire to get something for nothing at the public's expense.

"All productive science, both fundamental and applied, is essentially creative, and it is the result of the operation of man's minds and flowers most profusely in an atmosphere of maximum freedom," he continued.

"Increasingly the choice of what research organizations undertake to do—and their capacity for doing them efficiently—are coming to dictate much of industrial policy. Wise management will see to it that those who direct its research and development organization are an integral part of its policy making group. These directors of research must be more than able scientists and technologists—they must be industrial statesmen capable of viewing the problems and accomplishments of the laboratory not only as scientific achievements, but as part of an economic and social structure," he said in conclusion.

The second speaker of this session was Thomas Midgley, Jr., president of the American Chemical Society, who spoke by telephone from Dayton, O., on "The Future of Industrial Research as Seen by a Chemist."

"We are the only species of living creatures that even conceives of exerting any control over the environment thrust upon it," Dr. Midgley said in his opening remarks. "Admittedly, this control is far from complete. Its extension is greatly to be desired. To accomplish this extension we need to increase our knowledge of the universe in which we live. The only fundamental tool at our command, for extending this knowledge, is the reproducible experiment," he continued. "This is the accepted scientific method and, when applied to obtain a better understanding of our environment, is designated by such terms as fundamental research or pure science research or academic research."

Dr. Midgley then stated that for some reason, best known to our law makers, the discoverers of new facts are denied any special rights or financial benefits that ultimately may result from these discoveries. On the other hand those who can apply such discoveries to improvements of environment, for their fellow men, are granted the exclusive privilege of exploiting these improvements, for a limited period of time, provided they make public the nature and details of the improvements in documents called patents. In the early history of modern industry there is little evidence that it either knew or appreciated the fact that the patent system was responsible for its birth, but industrial research has now become an established part of modern industry and functions primarily in making use of the discoveries of academic research to improve our control over our environment, which then may be used for profit making through the patent process.

The fact that industrial or applied re-

search had to deviate periodically from its primary purpose and determine additional fundamental facts was mentioned and it was pointed out that despite the profit motives to keep secret these discoveries of fact, most industrial operators do make these discoveries public within a reasonable time. Dr. Midgley then devoted a considerable portion of his talk to a discussion of whether industrial research which has had such rapid growth during the past 25 years, had "caught up" with industrial production activities which have been developing during the past 150 years. He took issue with the idea that industrial research created "technological unemployment" and said that he could not agree with the idea that placing all industrial research under government direction would result in accelerated progress. Any of the proposed changes in our patent system would be likely to reduce rather than increase the number of patents applied for and thus retard industrial progress, he said.

During the past 25 years industrial research has expanded ten times, and 70,000 scientists are now engaged in it. Problems of the administration of industrial research were discussed, and Dr. Midgley closed his talk with a suggestion for better public relations with regard to industrial research in general.

"The public should be told just what research is when used by industry and how it benefits mankind. Then too, as little secrecy as possible should be placed around new fundamental knowledge. Publish as soon as is compatible with safety and notify the public of this through the daily press," Dr. Midgley said, and suggested that the audience keep in mind what Dr. Kettering once said: "When you lock the laboratory door, you lock out more than you lock in."

The final speaker of the morning session was Harry L. Derby, president of the American Cyanamid & Chemical Corp., who spoke on "The Views of Industrial Management." Mr. Derby said that his views, if condensed into a sentence, were that commercial programs of research and development will have served their purpose if, as a result, the life of man is prolonged, if his health and comfort are improved, if his happiness is enhanced, and if his productive ability and usefulness are enlarged.

"Research is now not only recognized as an integral part of business, but the United States has become the acknowledged world leader in this field," this speaker said and added that the future outlook is for research to occupy a still larger place in the plans of industrial management and to exert still greater influence on our economic life.

The importance of patents to men and organizations engaged in programs of research and development was emphasized with the comment that if the theory and the basis of our patent system are to be radically changed, large and small corporations may no longer safely risk their stockholder's funds in research; no longer may the individual be sure his idea will be protected; if these discoveries are to be free to all, then the incentive for burning the midnight oil disappears, and incentive has always been the motivating factor in industrial development in America.

The problems of providing employment for the returning millions of war veterans were discussed, and it was stated that

never did the manufacturing enterprises employ more than 25% of available labor and that the future of these young people must be worked out through the engagement in small businesses, as individuals, on the farms, and in private enterprise of their own initiation.

"They will find employment in industry to the extent that industry is able to develop and sell its products, including the new scientific developments and products of research," Mr. Derby declared.

As applied to a manufacturing business, research programs are economically sound if they have as an objective the production of better goods at lower cost. In conclusion, complete faith was expressed in the future of America, and this speaker said that he believed the present political and economic difficulties and interferences would be resolved, and that new and enlarged opportunities, many of them created by research, will enable this nation to continue the phenomenal advancement which is its birthright.

Colonel Dewey Speaker at Luncheon

Colonel Dewey spoke briefly at luncheon. He first paid tribute to Mr. Howard and his work as head of Standard Oil Development Co. and then, in discussing the future of industrial research, Colonel Dewey first emphasized that national defense as a problem does not end when the war is over, but that future new weapons depend on the ever-continuing research efforts of the process industries. Although more of the war developments may have come from the laboratories of large corporations than those of the smaller companies, Colonel Dewey said that speaking as a "small business man", he felt that the large and small companies would get along and work out their problems together if they both realized above everything else that in war or peace the research groups must be kept alive and that private initiative must be protected. He stated that he felt that private industry should carry most of the load of research effort except for our military needs. He also said that it was private industry that did most of the work behind the war efforts of the Office of the Rubber Director and the Petroleum Administrator for War, and this type of work must be kept going.

The Afternoon Session

The afternoon session sought to answer the question: "How can small business serve itself and be served by industrial research?" Several speakers on the program and others participating in the discussion stressed the point that the first requisite for the small company to obtain benefits from industrial research and development is the employment of technically trained men.

E. P. Stevenson, president, Arthur D. Little, Inc., speaking on "The Growth Factor in Small Business", stated, "It is becoming increasingly necessary for the small company to support a technical staff, and it is from these expenditures that it may expect to receive the highest return. Such a group can participate with benefit in the activities of the scientific and technical societies related to the company's industry, in the use of technical data published by the technical and scientific societies and government laboratories, through contacts with educational institutions, and through the assistance of large industrial research organizations that are back of the materials used by the company."

From experience gained as an administrator of the New England Industrial Research Foundation, which has as its major purpose the promotion and utilization of

research methods by New England industry, with the needs and problems of the small company a particular objective, Mr. Stevenson told the forum that (1) there is a widespread and intelligent interest in research by business executives in small companies; (2) more funds are available than are being spent; (3) research and development opportunities are recognized; (4) the missing element is in technical and scientific manpower.

"Many small companies," he concluded, "if they are to compete, and assuredly if they are to grow, must learn first to compete for technical men. If competent technical personnel is intelligently absorbed and utilized, effective research will follow almost automatically. Most small companies are probably aware of the significance of research, but many of them are still unaware of the methods by which research can be utilized within their budgets and their organizational structure."

The present need, Mr. Stevenson pointed out, is not of more sources of assistance. These he aptly referred to as research breadlines. Rather the need is of education of small company management in the advisability of employing technical personnel and in methods of utilizing available research assistance.

Edwin H. Land, president, Polaroid Corp., gave similar reasons for the employment of technologists by small businesses.

"It is not necessary for the small business to do its own research, but it must contain men who understand the scientific basis of its products so that the company can appreciate technical changes in the country as a whole, so that it can specify its requirements from the laboratories of large supplying companies, and so that it can be intelligent in buying research from professional research organizations and from foundations," Mr. Land pointed out. "When the small company thus uses its scientists only as advisers and liaison men, it is important that these men be given adequate, if small, laboratories, reasonable budgets for independent investigation and publication, and large travel allowances. The scientists in this simple arrangement should be absolutely free of responsibility for developing anything useful themselves, but must be heavily responsible for giving intelligent advice to the management."

Mr. Land pictured a new trend in corporate organization which is built up around the concept of continuous development of new and better products and an idea that such companies must be scientific and must remain small. Described by Mr. Land, such companies would, when they grow to a size of between 500 and 2,000 employees, encourage some of the younger men to "take one of the new developments and start a new company of the same type, in which, ideally, the old company has an interest and partial control only for a few years. Such a program seems to approximate an attractive industrial counterpart of Jefferson's concept of an American agricultural democracy."

In such a company the scientist is not merely an adjunct to a routine manufacturing organization, for the research attitude permeates every member.

Westbrook Steele, executive director, The Institute of Paper Chemistry, Lawrence College, addressed the forum on "Research by Trade Association and Co-operative Groups" and described purpose, work and results of The Institute of Paper Chemistry, founded in 1929 by 19 individual companies.

"While industries compete in services and products, their ultimate competition is for manpower," Dr. Steele stated.

The needed men must be scientifically trained, must have contact with the scientific and economic problems of the industry, understand the fields of fundamental science which are related to the raw material their industry uses, the processes through which it passes, the products which result, and their use.

"They must learn to harness scientific phenomena and develop their application for the benefit of the industry of which they are a part," he said.

He gave as his reason for endorsing collective research by an industry that it is imperative that research be accompanied by a training of men so that the results of research can be translated into production.

"Training of manpower without attendant research is like inbreeding," Dr. Steele told the forum, "it sharpens the line of current practice, crystallizes prevailing empiricisms, and bars the door to industrial progress."

Collective research within industries made for greater progress for the industry as a whole, he said, and benefited both large and small companies.

The subject of Clyde E. Williams, director, Battelle Memorial Institute, was "How the Research Foundation May Serve Small Business." He described the service rendered to industry by research foundations.

"The small business," he said, "if it is to function as advantageously from the technologic and research viewpoint as the large company, must have three main requirements satisfied: (1) It must have access to knowledge as to the broad, technical status of its own and other industries, of new operating practices, new products and materials as they become available as a result of research and development of others, and of contributions being made to science generally. (2) It must make or have made for it appraisal of the type or research or the direction in which its development should be undertaken. (3) It must have access to the facilities of a highly organized research laboratory such as has been described."

He pointed out that these conditions could be achieved through the sponsorship of research and development in a research foundation operated for the purpose of giving such service and staffed and equipped to work in the particular field involved.

The value of research by government to small business was discussed by A. C. Feldner, chief, Fuels and Explosives Branch, United States Bureau of Mines. Certain types of research, especially those related to conservation and national security, are a function of government, he indicated. The present projects of the Bureau of Mines that result in information widely useful to many small industries were cited as well as research projects of the Department of Agriculture and of the National Bureau of Standards, and other research agencies of the federal government. Mr. Feldner also outlined the cooperative research plans of the Bureau of Mines to help business, and especially small business. There are more than 50 research associates representing 14 industries stationed at the Bureau who are studying fundamental problems, the solutions of which have a wide application. The Bureau also conducts research in co-

operation with industrial groups or individual companies on problems in which there is a broad public interest, usually connected with conservation of life or mineral resources. The present policy, Mr. Feldner stated, in such cooperative research is to require the transfer of all patents arising from the work to the government.

Under-Secretary of War Dinner Speaker

Following a dinner attended by about 500 men and women prominent in research and development fields of the nation's industry, welcomed by Eugene Homan, president of the Standard Oil Co. of New Jersey, Mr. Howard spoke briefly on the history of patents, present concepts of them, their use to industry, and further declared that adjustment of current controversies between government and industry was possible because both points of view, in part, were incorrect.

Mr. Patterson addressed the forum on "What Place Should Industrial Research and Development Organizations Allocate to Future Work Directed Primarily toward National Security Rather Than Commercial Considerations?"

Stating that normal peacetime research was a function of industry rather than of government, Mr. Patterson said, "Research and development devoted to the weapons, tools, and techniques of war present us with a tougher problem. Such research will not go on to the extent required for our national security unless support, guidance, even control emanate from central mechanism."

In his opinion a single unified defense agency combining the Army and Navy would greatly help in solving many postwar military problems, for such an agency would facilitate the establishment of a corps of scientifically trained officers. When peace comes, it will be difficult to keep even a small portion of the best scientists to maintain war weapons at a high peak of effectiveness unless a suitable program is evolved to obtain such scientists for government service. Government officials have been considering several plans for a postwar agency with distinguished leadership and ample funds to promote branches of research and development which will effectively contribute to the military strength of the nation. Unattended and unsupported, such research cannot flourish.

"The adequacy of federal appropriations to promote military research will determine, in large measure, the contribution that can be asked of private enterprise in terms of personnel and laboratory facilities."

He stressed the necessity of cooperation between industry, university laboratories, government laboratories, and the Armed Services.

"Financing by way of subsidy or contract payments will, I recognize, often not be enough. We shall need other forms of incentive, financial in character or otherwise. Over and above that, we shall need the approval, the sympathy, the leadership from civilian as well as military circles to enlist public opinion in support of a sound program."

Mr. Patterson declared that he believed it was possible to find a solution to the exchange of patents and licenses which is of concern to industry. Test plants and proving grounds will likely be made available by the government to industry, he said, but the question of pilot plants was

related with the problem as to what research functions in the development of weapons the federal government itself ought to continue to perform.

Commenting on Secretary Patterson's address were Mervin J. Kelly, director of research, Bell Telephone Laboratories; Rear Admiral J. A. Furer, coordinator of research and development, Navy Department; and R. E. Gillmor, president, The Sperry Gyroscope Co. Each stressed the necessity of a postwar overall directing council for research and development related to national security. It was suggested that such an agency be composed of representatives of industry, the Armed Forces, and non-partisan representatives of the public interest. Such an organization, Mr. Gillmor said, would do much to promote liaison and interchange between industry and military services.

On Rubber Coating Replacements

THE possibility that resin fabric coatings will offer serious competition to rubberized fabrics in the postwar era was suggested in an address to a meeting of the American Association of Textile Chemists & Colorists at Atlantic City, N. J., October 14, by D. R. Powers, director of textile research and development, Monsanto Chemical Co. Under the broad caption of "Resin Fabric Coatings" he grouped several textile treating processes which improve tensile strength, water repellency, and wear resistance, minimize shrinkage, and decrease "cracking." To these Dr. Powers added Syton, a new development by which sub-microscopic specks of silica are deposited on either natural or artificial fibers. Work in the coating field, it was pointed out, has been centered on development of replacements for natural rubber.

"This problem," he added, "has been solved with unusual speed except one phase. The one unsolved problem is that of contriving a substitute for natural rubber in life rafts. Here there are extremely difficult specifications. The rubberized fabric must be flexible at eight degrees below zero, and the raft must be capable of sustaining life under a tropic sun during weeks of exposure."

He warned that much research must be completed to insure full advantages of the resin fabric coatings, but concluded that "many feel that the rubberized fabrics of prewar will be entirely replaced in the postwar period by the resin coatings developed to alleviate the rubber shortage."

H. M. Chase, director of the research division, Riverside & Dan River Cotton Mills, Danville, Va., told the textile chemists that the highest strength cotton yarns can now be made direct from roving by a fiber-bonding process. An average ring spun, multi-ply yarn, composed of single 12s yarn has a breaking strength of 15 pounds, he said. After chemical treatment with bonding agents, stretching almost to the breaking point, and curing, the same yarn has a breaking strength of 22.75 pounds. A further and "revolutionary" gain in breaking strength was obtained by treating a 1.5 roving, the equivalent of eight strands of the 12s yarn, by the new fiber bonding process. Such yarn, Dr. Chase disclosed, has a breaking strength of 24 pounds.

"The yarn may be made soft and flexible or hard as wire, according to the use

to which it is to be put. It may be treated so as to be compatible with rubber for tires and belts," Dr. Chase further declared.

Goodyear Sponsors Meeting

THE Los Angeles Rubber Group, Inc., meeting, held October 3 at the Mayfair Hotel, Los Angeles, Calif., was sponsored by the Goodyear Tire & Rubber Co. The technical session, under the direction of Philip Drew of the Goodyear company, was attended by about 50 members. Paul Beebe, manager of the process development and laboratory control department of the Goodyear company at Akron, O., discussed the processing difficulties of GR-S and answered the questions that came from his audience.

About 180 members and guests, including 60 employees of the Goodyear company, attended the dinner meeting. Among the guests were Sir Frank Beaurepaire, chairman, and Frank Birdsall, assistant factory manager, of the Olympic Tire & Rubber Co., Sydney, Australia. Sir Frank briefly outlined the current rubber situation in Australia. The speaker of the evening, Albert Hyma, professor of history at Redlands University, Redlands, Calif., defended the price of natural rubber as established by the British and the Dutch and expressed the view that after the war the East Indies should be placed under an international control.

Color films of the summer outing were also shown to the Group.

The door prize, a \$25 War Bond, was won by Richard Pauloo, of Goodyear, and a second door prize, a carton of cigarettes, went to Leroy Ketter, Monarch Roller & Gasket Co. Everyone present received a package of cigarettes and a large roll of friction tape as a table favor through the courtesy of the Goodyear company, which also donated the following prizes: two blankets, won by D. C. Maddy, Hycar Chemical Co., and Mr. Birdsall; two sets of crockery, won by George Wolfe, of Goodyear, and Harry Black, United States Rubber Co., Synthetic Rubber Division; and two American flag sets, won by D. Sheppard, of Goodyear, and Harold Calkins, Kirkhill Rubber Co.

A special technical meeting of the Group on October 17 was attended by about 45 members and guests. Following dinner at the Mayfair Hotel, A. C. Carlton, of J. M. Huber, Inc., spoke on "Improvement of the Quality of GR-S Compounds by Master-batch Processing." His discussion dealt only with tread-type compounds, and he stated in way of explanation that difficulties in obtaining duplicate physical test results on identical mixes of GR-S has led to an extensive investigation of the "concentrated master-batch" method of mixing conducted in the Huber laboratories the past several months. Very significant improvements in most physical properties of GR-S tread stocks when mixed by the master-batch method as compared with normal mixing, have been obtained. Among these are higher modulus without too much increase in durometer hardness and much better abrasion resistance.

Nominations for officers will be posted at the November 7 meeting, and voting will be by letter ballot sent to each member with the notice for the December meeting, which will be a Christmas theatre party at the Wiltshire Ebbell Theatre, Los Angeles, and the families of members are invited.

Large Attendance Hears Dinsmore at Boston Meeting

THE fall meeting of the Boston Rubber Group held in the Hotel Vendome on October 6 was attended by 350 members and guests. After dinner Chairman Joseph L. Haas turned the meeting over to John T. Blake, who acted as temporary chairman and introduced the speakers of the evening, M. C. Throdahl, of Monsanto Chemical Co., and R. P. Dinsmore, vice president in charge of research and development for the Goodyear Tire & Rubber Co.

Mr. Throdahl presented a very comprehensive paper on "Vulcanization of Buna S (GR-S) with Organic Sulphides." The abstract of this paper states that Buna S (GR-S) has been vulcanized with acid, thiocyanic, amine, thiuram, phenolic, and xanthogen sulphides. While some interesting heat embrittlement resistant properties have been developed with most of these, the alkyl xanthogen disulphides have been found to yield superior properties in heat embrittlement resistance, hysteresis (heat generation), cut growth, and flex cracking resistance. Examination of several derivatives showed the ethyl xanthogen disulphide to give best all-round properties, while accelerator variation indicated cyclohexyl benzothiazyl-2-sulphenamide and tetramethyl thiuram disulphide to be the most satisfactory. Addition of small amounts of mercaptans to ethyl xanthogen disulphide effected a pronounced improvement in flex cracking resistance.

Dr. Dinsmore spoke on "Rubber Processing Problems—Now and Postwar." He stated at the outset that his paper would discuss the problems of processing which affect the productivity of the rubber goods plants and the cost and quality of their output. These processing problems must be viewed in the light of continuing synthetic rubber operation after the war and with the expectation of an increasing rather than a diminishing production, and thus considered processing difficulties demand permanent and economical solutions.

Figures on the trend of rubber supply and demand for both prewar and postwar years were presented to emphasize that there would probably be no excess of supply for the next three years. The limiting effect of carbon black production accentuates the need of careful industry analysis and planning, supplemented by effective action since the rubber industry in this country is in an unusually favorable position to do capacity business after the war because of the large available capacity, the relatively simple conversion to civilian goods manufacture, and the pent-up demand for its products. It would be unfortunate, indeed, if imperfect planning should prevent the realization of the opportunity.

With respect to the general-purpose synthetic GR-S, it was pointed out that it was unwise to assume that GR-S was inherently inferior to natural rubber in every case where present processing techniques cause difficulty. Certain features of GR-S that make difficult the application of present methods were mentioned. These included the undesirable variation in the size of polymer groups of this rubber, the difficulty of pigment dispersion, lack of tack, and the fact that although GR-S was selected partly because of its compatibility with natural rubber, it is not nearly so compatible as might be desired.

A more specific examination of processing problems was then made. Under mixing, the effect of blacks, plasticizers, peptizers, and reclaim on GR-S was explained and illustrated. Of special interest in this connection were the data presented on effect of aging carbon black master-batch stocks

on the plasticity after remilling. Storage for three days gave the greatest reduction in Mooney plasticity, particularly with two or three remillings. Under the discussion of calendaring, the almost impossible job of frictioning square-woven tire fabric with an 80:20 mixture of GR-S and reclaim as compared with the satisfactory job obtained with a 65:35 mixture, was described. The necessity of using roller dies or tuber designs such as the duplex to minimize the drag on the edges of extruded GR-S treads was mentioned under tubing. The poor high-temperature characteristics of GR-S were presented under the discussion of molding to explain the difficulties experienced with this type of processing. In tires, belts, and such fabric-containing articles, blowing between the plies is aggravating by the poor hot-tear and the low moisture permeability of GR-S; while knots and slubs in fabric cause more than 50% of the blown spots because the rubber does not adhere to them.

Butyl rubber, the preferred synthetic for inner tubes, handles easily and efficiently, if kept free from contamination, up to the time of tubing, but gives trouble in tube manufacture because of thinning at the fold and pinching under the machine-splicer clamp. It also gives thin spots and porous spots in the mold cure. Higher Mooney viscosity Butyl with soft black was considered an improvement.

The continuation of neoprene's position as a preferred synthetic rubber depends on its competitive cost, which seems to have good possibilities for the future, and its processing properties. Too great variations in processability and rate of cure because of the incomplete stability of the neoprene crude were mentioned as the problems with this rubber.

With respect to the effect of postwar supplies of natural rubber on the rubber industry, it was emphasized that there will be a worldwide demand, and we will be fortunate if we get 40% of the available crudes in the first two years after the war. In the absence of war demands 300,000 to 350,000 tons of natural rubber would put us in good shape, quality-wise, if used in truck and bus tires, tubes if not satisfactorily manufactured from Butyl, and some mechanical, insulation, and sundries items. It was pointed out that the condition of plantation crude rubber at first is likely to be bad because of variable moisture content and other factors, which will make it a not unmixed blessing.

It is not necessary to adopt an extreme nationalistic or isolationist viewpoint in order to appreciate the vital importance of having a source of rubber near to our hand.

"There are few people in this country who do not now realize the vital importance of rubber to our total economy, in peace or war. It is unthinkable that we should again place the key to that economy in the hands of others, now that we have with such effort, obtained possession of it. Economical processing is one important factor in this situation affecting the safety and future economic development of our country. Let us not take the responsibility lightly," Dr. Dinsmore added.

It was announced that a committee to nominate officers of the Boston Group for next year, consisting of the last three chairmen: Lawrence Clarke, Harold Liddick, and Donald Wright, had been appointed and would report their nominations at the next meeting. Attendance at this December meeting, the main feature of which will be the annual Christmas party, will probably be confined to members only.

Rubber Division Elects Officers

OFFICERS for 1944-45 of the Division of Rubber Chemistry, American Chemical Society, were recently elected by letter ballot. Those elected include: chairman, W. A. Gibbons, director, research and technical development department, United States Rubber Co.; vice chairman, W. W. Vogt, manager of development, tire and chemical division, Goodyear Tire & Rubber Co.; secretary, H. I. Cramer, director of development, Sharples Chemicals Inc.; treasurer, C. W. Christensen, sales manager, Rubber Service Laboratories Division, Monsanto Chemical Co.; sergeant-at-arms, M. F. Torrence, group head, tire development, rubber laboratory, E. I. du Pont de Nemours & Co., Inc.; directors, A. H. Nellen, development manager, Lee Rubber & Tire Co.; Fred Amon, technical director, Godfrey L. Cabot, Inc.; B. S. Garvey, Jr., technical director, synthetic rubber, chemical division, The B. F. Goodrich Co.; and C. R. Haynes, manager, rubber service, Binney & Smith Co. Harold Gray, technical superintendent, Goodrich tire division, and immediate past chairman of the Division, also becomes a director of the Division, and C. C. Davis, chief chemist, Boston Woven Hose & Rubber Co., and S. G. Byam, sales manager, du Pont rubber chemicals division, are *ex-officio* members of the executive committee.

New Processes Demonstrated

THE fall meeting of the New York Rubber Group, October 6, at the clubrooms of the Building Trades Employers' Association, 2 Park Ave., New York, N. Y., was attended by about 325 members and guests. A technical session, preceding the cocktail hour and dinner, featured two illustrated papers, "Injection Molding of Rubber", by D. F. Fraser, Monroe Auto Equipment Co., Monroe, Mich., and "Variations of Physical Tests of Elastomers between Different Laboratories", by Captains H. B. Morris and C. H. Gerwels, both of Edgewood Arsenal, Md.

Mr. Fraser described the Chrysler continuous injection molding and extruding machine¹ for rubber and plastics. The paper by Captains Morris and Gerwels was indicative of how wide variations can be in tests on identical samples of rubber when conducted by various laboratories. Two methods were used in their investigations. In Method A several laboratories prepared duplicate sets of slabs of rubber material. One was retained; the other sent to Edgewood Arsenal. All slabs were tested on the same day by the laboratories and the arsenal. In Method B standard test slabs of as nearly identical material as possible were compounded and cured at Edgewood Arsenal and sent to various rubber and standard testing laboratories. The tests investigated were those of Shore A hardness, tensile strength, ultimate elongation, modulus at 200% elongation, and tear resistance in accordance with A.S.T.M. designation on D624-41T. Method B. The results of the investigation were taken as evidence that correlation of testing is a major problem for which a solution must be found. It was not stated whether the factor of humidity and its effect on the slabs at time of test were considered.

After dinner, G. H. Swart, head of the research laboratory of General Tire & Rubber Co., demonstrated the carbon black-latex dispersions process² now in operation for 7,500 tons of the 30,000-ton annual ca-

¹ INDIA RUBBER WORLD, Oct., 1944, p. 87.

² *Ibid.*, Sept., 1944, p. 667.

capacity of the government plant operated at Baytown, Tex., by the company. For practical large-scale operations EPC channel black in bead form is mixed into a slurry with water, and dispersion agents are added. Condensation products of naphthalene sulphonic acid and formaldehyde, lignin sulphonic acids, and glucoside extracts were among the various dispersing agents tested for this purpose. An air-activated conveyor is used to transfer the carbon black beads from the cars. Other problems in development of the process involved the proper disintegration of beads for the most suitable wet slurry and coagulation of the latex-carbon black mixture. Mr. Swart said that a rapid one-step "shock" coagulation method was found best and that wet grinding of the carbon black beads with an impact pulverizer aided preparation of the slurry. Millroom output has been increased 25 to 30% by using this method of mixing carbon black with GR-S. Carcass stocks made with this type of carbon black master-batch may have improved properties. Samples of camelback with increased tensile strength have been obtained.

It was announced that the annual Christmas party of the Group will be held December 15 at the Building Trades Employers Association Club.

Chicago Rubber Group Meets

THE Chicago Rubber Group meeting, October 20, at the Morrison Hotel, Chicago, Ill., was attended by 175 members and guests. Announcement was made of a synthetic rubber reclaim prize contest sponsored by the group.

E. A. Hauser, Massachusetts Institute of Technology, briefly reviewed the Institute's activities in the field of rubber chemistry and stressed recent experimental work in the reclaiming of synthetic rubber.

D. S. le Beau, research associate in the M. I. T. chemical engineering department, discussed recent developments in the study of the structure of natural and synthetic rubber with the electron microscope and from an optical approach. Current research demonstrates that the molecular weight distribution in natural rubber covers a far greater range than that in synthetic, and this difference as well as the configuration of the molecules of the polymer are the basic reasons for the differences in physical properties, Dr. le Beau stated.

Indiana Night will be celebrated at the next meeting of the Group, November 17, at the Hotel Morrison. R. O. Dutt, General Tire & Rubber Co., Wabash, Ind., is chairman of the Indiana Night committee. D. F. Fraser, manager, rubber division, Monroe Auto Equipment Co., Monroe, Mich., will speak on "The Chrysler Rubber Injection Molding Process."

Mark Addresses Thiokol Club

THE Thiokol Technical Club held its first open meeting of the 1944-45 season October 10 at the plant of Thiokol Corp., Trenton, N. J. The meeting, attended by local rubber and plastics chemists and visiting chemists of northern New Jersey industries, was preceded by an inspection tour of the Thiokol laboratories and a dinner.

At the technical session H. Mark, Polytechnic Institute of Brooklyn, presented a paper on high polymer chemistry. He stressed the basic similarity between rubbers, plastics, and fibers. The differences in the materials he ascribed to a balance

between strength of secondary valence forces between chains, ease of packing of chains, and the relative effect of temperature on these two factors. Secondary factors are chain length, cross-links, and heterogeneity caused by copolymerization, Dr. Mark said.

Northern California Group

MORE than 50 members and guests attended a meeting October 10 of the Northern California Rubber Group at the Hotel Claremont, Berkeley, Calif. It was announced that the Navy's Meritorious Civilian Service Award had been given to R. E. Morris, senior rubber technologist at Mare Island Navy Yard and a member of the Northern California group. Motion pictures of the Group's 1943 and 1944 summer outings were shown by H. J. Jordan, E. I. du Pont de Nemours & Co., Inc. A bottle of beverage donated by the du Pont company was won by G. B. Farwell, Reliance Rubber Co., Oakland, Calif. C. A. Carlton, of J. M. Huber, Inc., addressed the meeting on "The Relation of GR-S Processing to the Physical Properties to be Derived." Some details of Mr. Carlton's paper, which was also presented at a meeting of The Los Angeles Rubber Group, Inc., are given in a report of that organization's meeting.¹

¹ See p. 194.

Tire Cord Fatigue Testing

COMMITTEE D-13 on Fabrics, of the American Society for Testing Materials, met October 18-20 at the Park Central Hotel, New York, N. Y., to consider revisions of specifications and other matters. Sub-Committee A-1, Section IV, Tire Fabrics, at a meeting October 20, attended by about 40 members, approved a proposal for revision of specifications for testing both rayon and cotton tire cord. The revised specifications on tire cord will be submitted to letter ballot at an early date, and the new specifications for cotton tire cord testing will be presented at the next meeting.

A paper, "Statistical Comparison of Rayon Tire Cord Fatigue Testing", by C. B. Budd and Lewis Larrick, of the textile research department of The B. F. Goodrich Co., was presented by Dr. Larrick at the sub-committee meeting. Previous discussion in 1943 by representatives of tire manufacturers and the suppliers of high-tenacity rayon on fatigue testers for rayon tire cord, and the fact that only one tire company found it possible to rely on its fatigue tester to the extent of actually accepting or rejecting yarn for production on the basis of fatigue tests led Sub-Committee A-1 to sponsor a direct inter-comparison of the testers, Dr. Larrick declared. Fourteen 1100/2 cords in identical twists were prepared and distributed to nine companies for tests. Apparently the differences between the yarns of these cords ran the gamut of what is known to be good and bad in high-tenacity yarn manufacture. Mr. Budd and Dr. Larrick analyzed the comparative test results statistically and found remarkable results among 11 machines. Fatigue results in actual service, Dr. Larrick stated, cannot be predicted from machine tests. The fatigue testers have elements in common other than those given by tensile machine tests. Data were insufficient to isolate common elements, but it was sufficient to illustrate a method of analysis which is

capable of going a long way in isolating the elements in question.

"Although we cannot determine which tester most satisfactorily predicts tire performance, we find remarkable agreement among them," the speaker added.

It was found that tensile and elongation are important elements in many of the tests, but all fatigue results cannot be predicted on them for any tester. Because in some cases even the fatigue results were independent of these factors, it was concluded that there are other, unknown elements. The Goodrich tension vibrator was determined to be outstanding in its correlation with the other testers. It gave to a marked degree the information given by each and all the other 11 testers.

Ontario Section Hears Blake

THE first meeting of the recently formed Chemical Institute of Canada was held October 16. About 320 people attended the dinner at the Royal York Hotel, Toronto, Ont., when R. V. V. Nicholls, of McGill University, Montreal, P. Q., and director of information for the Chemical Institute, outlined its functions.

Following dinner the Ontario Rubber Section met separately with an attendance of about 65 members and guests. John T. Blake, director of research, Simplex Wire & Cable Co., Cambridge, Mass., spoke on "Reinforcement of Elastomers." Pointing out that doubt exists that fillers increase tensile strength as calculated on the cross-section of natural rubber at break, Dr. Blake said that because pure gum compound tensiles are sensitive to the manner of testing, true tensile should be calculated on a zero cross-sectional test piece. Although such tensiles can never be obtained practically, extrapolated curves do support the idea that the tensile strength at break of natural rubber compounds is not increased by fillers. Butyl rubber is similar in this respect, but the tensile product of neoprene is always decreased by the addition of a filler, the speaker added, and indicated that this decrease is nearly the same for all fillers, whether they are diluents or so-called reinforcing materials. Carbon black sharply increases the tensile product of Perbunan; in GR-S the increase is even greater; while non-carbon black fillers increase the tensile product of GR-S somewhat, Dr. Blake said. Auxiliary agents such as mineral rubber, Cumar, and certain antioxidant-type materials have a profound effect on the reinforcement of GR-S by certain non-black fillers, it was explained; while Flectol H and zinc oxide reinforce GR-S to about the same extent as medium channel black. The tear resistance of GR-S compounds helps explain the differences between them and those of natural rubber, but the theories for the reinforcement of GR-S are inadequate.

A.S.T.M. Book of Standards

PUBLICATION of the "1944 Book of Standards" by the American Society for Testing Materials, 260 S. Broad St., Philadelphia 2, Pa., has been announced for December. Heavy demands for the 1942 edition and its supplements have necessitated advancing publication by a full year. Normally the book would not appear until 1945. The new revision, providing authoritative specifications and tests for a wide range of engineering materials, will contain some 6,000 pages in three parts.

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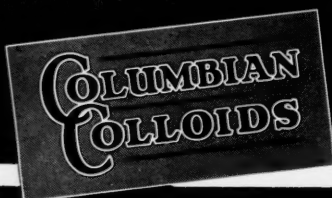
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Plasticizer Improves Elongation of GR-S

LOW-COST GR-S mechanical goods stocks are reported obtainable through the use of TR-11, a neutral plasticizer, and high carbon black loadings. A compound containing 100 parts GR-S, 100 parts EPC black, 45 parts TR-11, and five parts zinc oxide and cured 50 minutes at 298° F., tested as follows: Duro, 70; tensile, 2,000 pounds per square inch; elongation, 600%; modulus at 300%, 970 pounds per square inch. A sample aged 24 hours at 212° F., showed a Duro of 78, a tensile of 1,930 pounds per square inch, an elongation of 450%, and a modulus at 300% of 1,500 pounds per square inch. Because TR-11 is a neutral as regards cure, it is claimed that stocks containing it do not lose elongation rapidly or greatly increase in hardness when heat aged. Friction stocks which are not excessively sticky on the mill, yet possess good tack are said to be obtained when TR-11 is used in combination with Galex. The plasticizer is a product of the Thiokol Corp., Trenton, N. J.

Aliphatic Derivatives

SEVERAL aliphatic derivatives consisting of the even-numbered normal hydrocarbons from C₈ through C₁₈ and the corresponding olefins, alcohols, ethers, mercaptans, thioethers, disulphides, and sulphonic acids have been developed by the chemical division of the Connecticut Hard Rubber Co., as a result of its research in the synthetic rubber field. Most of these new chemicals are available in commercial quantities and are supplied in various grades from technical to "fine chemical."

The olefins, with the double bond at the first carbon, are suggested for use as intermediates for organic synthesis, particularly as a starting material for dispersing agents, resins, and other chemicals. The aliphatic ethers can be used as plasticizers, impregnating agents, solvents, and heat transfer liquids. The mercaptans are said to present possibilities as polymerization conditioners. The thioesters and disulphides are suggested as plasticizers and stabilizers, among other uses.

Plasticizer for Neoprene

PARAPLEX AL-111, a low-cost alkyd-type resin plasticizer, is said to be highly compatible with Neoprene GN for the production of soft, permanently dead stocks. Such Paraplex AL-111-containing stocks are reported to vulcanize with no appreciable effect on curing rate. The vulcanizates, it is claimed, show excellent resistance to heat service and aging and somewhat superior resistance to extraction compared to other oil or resinous softeners inasmuch as there is some evidence that Paraplex AL-111 is appreciably converted during vulcanization. Vulcanizates containing this plasticizer also show the resilience and cold crack associated with more expensive ester-type plasticizers. Paraplex AL-111 is a dark fluid solvent-free resin with a specific gravity of 0.98 and is available without restrictions. The manufacturer, The Resinous Products & Chemical Co., Washington Sq., Philadelphia 5, Pa., recommends Paraplex AL-111 for Neoprene GN stocks which are to be molded or extruded.

Plastic Nylon Wire Coating

A NYLON plastic compound for coating electrical wire was revealed October 19 by J. W. Shackleton, plastics department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., at a meeting of the Wire Association in the William Penn Hotel, Pittsburgh, Pa. On a commercial machine having a two-inch screw, du Pont laboratories have extruded nylon jackets seven mils in thickness (overall diameter 40 mils) at rates of speed more than 1,000 feet per minute, Dr. Shackleton said. The die used is a modified, self-centering tubing design which permits free flowing of the nylon. A tube is extruded and laid snugly over the wire; the wall thickness is controlled primarily by the wire speed. Coatings of less than one mil in thickness have been applied by this method. The compound is said to be sufficiently heat stable to be left in the extrusion machine during shutdowns. There is no danger of degradation of the polymer if the machine temperatures drop 25 to 30 degrees below nylon's melting point.

Dr. Shackleton also disclosed that a special friction tape made of polythene is now being manufactured for patching insulated wires of various types. Polythene may be modified by the addition of other ingredients, he stated, and will be available in a variety of colors. A number of different formulations adapted to special uses may be expected as development progresses in the use of such additives as paraffin, natural rubber, gutta percha, and other materials.

High Polymer Courses Offered

THE Polytechnic Institute of Brooklyn, 99 Livingston St., Brooklyn 2, N. Y., is offering for the first time a coordinated series of 10 evening courses dealing with the formation and properties of high polymers in order to produce the highly trained polymer chemists needed in the expanding synthetic rubber and plastics industries. The courses include: organic chemistry of high polymers; structural analysis with polymer research; mechanical behavior of high polymers; structural analysis with X-rays; practical application of X-rays to structure determination; and chemistry of synthetic plastics and elastics. The program is under the direction of H. F. Mark, professor of organic chemistry at the Institute. Classes began October 2 and will extend to May, 1945.

Perkins Medal to Dr. Bolton

THE American Section of the Society of Chemical Industry has announced the election of Elmer K. Bolton, chemical director of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., to receive the Perkins Medal. Presentation will be made at a dinner meeting of the Society, January 5, 1945, at the Commodore Hotel, New York, N. Y. Dr. Bolton, who will be the thirty-ninth member of the group of distinguished chemists to receive this medal, is particularly recognized for his leadership in the synthesis of neoprene and for his direction of nylon research. He has had responsibility for research on a wide variety of organic chemicals including rubber accelerators and antioxidants. An informal reception for the medalist will be held at the Commodore Hotel immediately before the presentation dinner.

Acetyl Peroxide Made Safe for Industry

A VAILABILITY of acetyl peroxide, an outstanding polymerization catalyst, as a 30% solution of acetyl peroxide in dimethylphthalate was recently announced. This solution is a water-white, non-explosive liquid, immune to shock and impact. Because 100% acetyl peroxide cannot be shipped, used, or even manufactured on a large scale, the Buffalo Electro-Chemical Co. carried out extensive research to overcome these difficulties. The new product is a form of acetyl peroxide suitable for commercial purposes that can be handled with safety and ease. Other applications of the chemical include its use in vulcanization and as a bleaching and oxidizing agent.

A.S.M.E. Meets November 30

THE 1944 annual meeting of the Rubber and Plastics Division of the American Society of Mechanical Engineers will be held November 30 at the Hotel Pennsylvania, New York, N. Y. Scheduled papers include: "Advances in Rubber during 1944", by J. W. Liska, Firestone Tire & Rubber Co.; "Creep and Relaxation in Rubber Products", R. D. Andrews and A. V. Tobolsky, Princeton University; and "Use and Evaluation of Some Specialty Adhesives", F. J. Wehmer, Minnesota Mining & Mfg. Co. Four papers on plastics will also be presented.

Trichlorcumene

TRICHLORCUMENE (isopropyl trichlorobenzene), suggested as an ingredient of chlorinated rubber paints, rubber solvents, and plastic compositions of various resins and waxes, as a solvent, diluent, and plasticizer in protective coating compositions, and in insulating compositions for wiring, electrical equipment, and machinery, and for several other uses, is a colorless liquid with a mild aromatic odor. It is insoluble in water, soluble in alcohol, ether, and most common solvents, and reported to be highly stable, not readily oxidized or hydrolyzed. It is stable in glass at the boiling point (260° C.). Trichlorcumene is compatible in varying degrees with Abalyn, chlorinated rubber, Gilsonite, Piccolyte, Picoumaron, polyvinyl chloride, polystyrene, and other chemicals. At 15° C. there are 10.75 pounds per gallon. Experimental quantities are available from the producer, Hooker Electrochemical Co.

New Extenders

DIELEX and Dielex Alba are low capacitance dielectrics for use with natural or synthetic rubber. Dielex is basically Gilsonite, compounded for easy incorporation in rubber. The material is said to impart low water absorption and high modulus to rubber and is recommended by the suppliers for use in wire insulation where freedom from distortion defects during processing is needed. Dielex Alba is a white synthetic wax. It has essentially the same characteristics as Dielex and is recommended in place of it where white or colored insulation is required. Both are available from Herron Bros. & Meyer, 82 Beaver St., New York 5, N. Y.

UNITED STATES

War Developments' Effect on Industry's Future Get Much Attention; Advance Listing Made of DPC Plants for Sale

The many and far-reaching developments connected with rubber production and use which have occurred in this country and abroad during the present war and their effect on the future progress of the rubber industry received an increasing amount of attention during October from various government and industry spokesmen. A most optimistic view of the future of the American rubber industry was taken by P. W. Litchfield, chairman of the board, Good-year Tire & Rubber Co., writing in the *Financial World*; and the United States Tariff Commission released on October 5 a very extensive report on "Rubber", which, as indicated in the foreword, was prepared in response to requests from the Senate Committee on Finance and the House Committee on Ways and Means for information on the principal domestic industries affected by war changes.

Director of War Mobilization James F. Byrnes on October 4 released a report of Chairman Paul V. McNutt of the War Manpower Commission showing the progress being made in meeting the manpower needs of critical war production, including bus and truck tires, tire cord and fabric, and synthetic rubber. Evidence of the uneasiness of labor regarding future earnings and its interest in an early decision by the government on retaining or discarding the "Little Steel" formula was reflected in several cases of work stoppage throughout the industry.

The government through the Defense Plants Corp. in a surprise move made public an "advance listing" of plants, including those of the new synthetic rubber industry, which would be classed as surplus property and sold to the highest bidder soon after the war.

The Tariff Commission Report

In a report of more than 100 pages the Tariff Commission surveyed the prewar, war, and probable postwar rubber industry in the United States, with special reference to problems of public policy, and some of these problems will call for "difficult decisions in the realms of national and international policy", as the report puts it. With respect to the present and immediate postwar future of synthetic rubber, a cost for Buna S rubber in the postwar period of between 13 and 18½¢ a pound or about equivalent to advance estimates for the cost of production of this rubber, if made from petroleum during the war period, was suggested as being too high for competition on an equal basis with natural rubber from British Malaya and Netherlands India at 10 to 12¢ a pound or less. Even allowing for a considerable increase in the consumption of rubber in foreign countries after the war, which this report does not believe probable, the maximum estimate for world consumption will apparently be much below productive capacity, on the assumption that the Far Eastern areas will be able to produce on a large scale, the report states further.

Turning to the more distant future of the rubber industry or about the period of the 1950's, it is admitted that it is more

difficult to forecast prospects for the industry here than for the first few years after the war.

"If the United States and other countries now enjoying a high national income should maintain high income and high consumer purchasing power, and if some measure of recovery in war-wrecked countries should be achieved, the demand for rubber in this second postwar period would probably be strong, even at prices not lower than prevailed before the war," is the opinion of the Tariff Commission.

There is no immediate necessity of arriving at far-reaching policy decisions with respect to rubber for this second postwar period, it adds. For reasons of national security the maintenance of a large government stockpile is strongly recommended: while the chief factor weighing against government aid for the purpose of maintaining a great part of our present synthetic industry in operation after natural rubber again becomes available on a prewar scale is the adverse effect upon our export trade and industries, the report points out. The view that synthetic rubber will not be competitive with natural rubber after the war is repeatedly expressed and in considering objectives toward which a national rubber policy should be directed, it is stated that these objectives should be to safeguard the national security while at the same time avoiding unnecessary burdens upon our foreign trade and unwarranted exactions from the consuming taxpaying public. Reference is made to a basic difficulty encountered by the United States in its international commercial and financial transactions, which has been, and presumably will continue to be, a tendency toward an excess of outgoing over incoming goods and services, with consequent inadequacy in the supply of dollar exchange in the hands of foreigners to pay for our exports. Central features of a possible future rubber program are indicated as the maintenance of large imports of natural rubber, and of a large stockpile of both natural and synthetic rubber in the United States, the retaining in operation of some substantial part of the present capacity for producing bulk-use synthetic rubber, and, in addition, keeping other synthetic plants available in a standby condition for emergency use. It is also suggested that there should be somewhere in the administrative branch of the government, subject to general or specific limitations of Congress, an organization responsible for the above-mentioned parts of the future rubber program.

Details of lease and operating contracts between the government and companies operating the various synthetic plants are reported. Both lease and operating contracts are for a period ending five years after the plant is completed and ready for operation. The lease is terminated in the event of cancellation of the operating contract, which either party may do on 90 days' notice. The production contracts for synthetic rubber as such do not include allowances for patent royalties (except in the case of neoprene, where royalties payable by the operator to others are included; these royalties have been materially reduced, as compared with prewar royalties). While the production

contracts for butadiene and styrene do include patent royalties besides operating fees, the operating fees for producing butadiene and styrene are lower than those established for the production of synthetic rubber. DPC has agreed to negotiate with the operating company for 60 days after the termination of the lease for the purchase of the plant, machinery, and equipment, or any part thereof. It is further agreed that DPC will not during the lease and for a period thereafter (usually two to six months) sell or lease the plant, machinery, or equipment to any party except another branch of the government unless it shall first have offered the same for sale or lease to the operating company at a price or rental and on terms and conditions equal to the best offer received by DPC, and the operating company shall have failed or refused to purchase or lease the same within 30 days after such offer.

The importance of patents to the synthetic industry after the war is also discussed, and it is mentioned that a large number of patents in the synthetic rubber field based on applications filed by nationals of enemy and enemy-occupied countries have been vested in the Alien Property Custodian and have been made available to the public, for the present at least, on a nominal royalty basis. Whether these patents will remain available to all the synthetic rubber producers after the war or whether they will be permitted to revert to private ownership has not yet been determined, the report points out. Referring to the program of licensing and cross-licensing of patents sponsored by Rubber Reserve Co., it is revealed that commitments have been made by the patent owners for the postwar licensing of the production of butadiene from petroleum sources, with specified ceilings on royalties; the royalty for private operation is, however, materially greater than that for government operation. Commitments have also been made by the patentees with respect to the production of styrene, with specified ceiling on royalties. The owners of the principal Butyl patents have agreed to extend licenses after the war to the operators of the plants now owned by the government, whether or not the plants remain under government ownership. The owners of the neoprene patents have agreed to negotiate with any purchaser of a government-owned neoprene plant for postwar operation. The opinion is expressed that it is reasonable to expect that patents will exert a less dominating influence on the synthetic rubber industry during the immediate postwar period than prior to the war.

In a final summary of the postwar situation the direct relation between the consumption of rubber and the level of national income is emphasized, and even assuming that the national income after the war does not on the average exceed prewar levels, increasing consumption of rubber in the United States is considered possible, particularly if the trend of rubber prices is toward lower and relatively more stable levels than before the war. It is also considered probable that the world outside the United States will greatly increase its rubber-tired transport facilities both on the road and in the air.

Mr. Litchfield's Views

Somewhat similar views on the possibility of greater postwar rubber consumption were given by Mr. Litchfield in the *Financial World* for October 18. A bright outlook for the rubber industry was believed possible because of the very large volume of all types of rubber that will be available after the war and which will

act as a potent stimulant to ingenuity and talent for invention, with the result that new uses for rubber and rubber products are likely to be developed at a pace much more lively than that of the pre-synthetic era, according to Mr. Litchfield. This together with the stabilizing effect of our new synthetic rubber production on the prices of raw rubber should constitute incentives to greater production. Tires for passenger cars, trucks, and buses will be required in much greater than prewar volume for a long time after the war, and tires for farm production and construction work will be needed in large numbers during the reconstruction and rehabilitation periods following the war.

"Rubber has a great and growing place in the improvement of the standard of living of the entire world. The American rubber industry, in taking advantage of the opportunities and accepting the responsibilities that lie ahead, may move with confidence that its course is economically sound and morally constructive," Mr. Litchfield concluded.

Manpower and Labor Problems

Officials of the United Rubber Workers Union presented their case before the War Labor Board in Washington about the first of October, for wage increases above those permitted by the "Little Steel" wage formula. The achievements of 200,000 rubber workers in meeting increased demands for war production while wartime developments indicated the possibility of decreased security of postwar jobs was stressed. Wage rates now anchored to May, 1942, living costs are not adequate since by every index, living costs have been shown to be greater than the May, 1942, level, it was said.

A work stoppage involving about 1,000 workers took place at the Goodyear Akron Plant 1 on October 4, but work was resumed the next day. A work stoppage was threatened at the Goodyear Aircraft Corp. plant in Akron on October 19, and on the same day it was announced from Detroit that 500 URW members at the plant of United States Rubber Co. there had been fined \$12 each for engaging in a work stoppage.

A report by Mr. McNutt released October 5 stated that August output of heavy-duty tires was estimated as 330,000, an increase of 11% over July, and that although successful recruiting had secured more than two-thirds of the new workers needed, separations in July of between 7% and 10% were a major problem. Total employment in 30 tire cord plants increased 570, or 1.7%, during July, and increases were expected to continue. High labor turnover and excessive absenteeism were still major problems. By August 1 employment in 10 plants producing high-tenacity rayon yarn totaled 27,100, an increase of 659 over July 1 and 1,460 over June 1. Employment at 31 synthetic rubber plants declined 1.4% during July to a level of 20,455, largely as a result of the diversion of butadiene to the high-octane gasoline program and to increased efficiency.

Export Levy Postponed

Rubber Reserve Co. on October 5 issued Circular No. 29 requiring exporters to pay Rubber Reserve an amount equal to 17½¢ per pound of natural and/or synthetic rubber used in products exported from the United States, except for Lend-Lease exports. This proposed refund regulation met with such vigorous opposition from the rubber manufacturers and exporters that on October 18, Circular No. 31 was issued, in which it was stated that "it has been de-

cided that the effective date (October 23) of said control arrangement shall be temporarily postponed until further notice pending certain necessary readjustments in said arrangement. The control arrangement as so readjusted will be made effective as of a future date to be announced at the time the readjusted arrangement is announced, which date will be late enough to permit full compliance by the persons thereby affected."

"Advance Listing" of Synthetic Plants

Although it was generally believed to be a routine procedure and not to have any very great significance, the listing in late October by DPC in Washington of all of the government-owned synthetic rubber production facilities for disposition, if anyone was interested in bidding, came as something of a surprise since these plants must be kept in production for a number of years even after the end of the war with Japan. Secretary of Commerce Jesse Jones was reported as having made clear that the announcement was only an "advance listing" and that with but few exceptions, the plants described are not classed as surplus property, but are being used actively in the war effort. He said that the listing represented an effort to enable industry, both large and small, to purchase or lease these plants to convert them to civilian production as quickly as possible after they are no longer needed for war purposes.

It is obvious from the details of the present operating and lease contracts as revealed in the Tariff Commission's report that if and when any more definite action is taken to dispose of the synthetic rubber plants to private industry, it will require a period of from six to nine months to complete any individual negotiation.

Increased Natural Rubber Imports

The United States this year is receiving as reverse Lend-Lease from the British Commonwealth sources 78,000 tons of nat-

ural rubber, the Foreign Economic Administration reported on October 9. About 70,000 tons are coming from Ceylon, 4,500 tons from United Kingdom stocks, 3,100 tons from India, and the balance from British territory in the Western Hemisphere. The United States is this year supplying general-purpose synthetic rubber to the United Kingdom under Lend-Lease amounting to 86,000 tons. This arrangement permits the United States with her large manufacturing capacity to turn out more tires for her own military purposes and also for the Allied forces overseas than she would be able to by relying on crude rubber from Latin America, Liberia, and elsewhere, the FEA reports.

"Current Export Bulletin No. 202", issued October 21 by the Foreign Economic Administration, Washington, D. C., on "Commodities Exportable to Middle East Destinations" relates to such products as acids, alkalis, gums, resins, inorganic chemicals, oils, organic chemicals, pigments, rubber accelerators and antioxidants, medical and health supplies, tires, cable, mechanical spares, belting, hose, jointing including rubber asbestos, cotton yarn, storage batteries, retreading machinery, plastic molding machines and presses, testing apparatus, indicating and recording instruments, insulated tape, wire, and typewriter parts.

Federal Trade Commission, Washington, D. C., has issued a cease and desist order to the Rub-R-Lyfe Co. against advertising that its product, Rub-R-Lyfe, (1) softens hardest rubber for commercial use; (2) preserves or renovates rubber against atmospheric conditions, or stops checking, cracking, oxidation, or frictional heat in rubber, or (3) restores the original resiliency or elasticity of rubber.

Office of Contract Settlement, Washington, D. C., recently issued Regulation No. 4 to assure prompt removal of government-owned equipment from private plants whose war contracts have been terminated. This regulation affords the contractor the opportunity either to buy the equipment or have it removed promptly from his plant within 60 days after request for removal, except when necessary for other war purposes.

National Association of Manufacturers, 14 W. 49th St., New York 20, N. Y., will hold its forty-ninth annual congress of American industry December 6, 7, and 8 at the Waldorf-Astoria Hotel, New York. Called the "Reconversion Congress of American Industry", with the theme, "Beyond Victory—A Better Nation", it will cover such problems as cut-backs and layoffs, veterans' rehabilitation and reemployment, peacetime production and jobs, taxes, world reconstruction and foreign trade, postwar distribution, and wage and labor policies.

The Sixteenth National Exposition of Power & Mechanical Engineering at Madison Square Garden, New York, N. Y., November 27 to December 2, will feature equipment for the control and distribution of power. The 1944 show was originally planned to serve as an aid to war production. War progress and reconversion planning, however, having sharply altered the industrial outlook, it now appears that the biennial power show will cater more strongly to the needs of civilian production.

CALENDAR

- Nov. 3. Akron Rubber Group. Mayflower Hotel, Akron, O.
- Nov. 3. Rhode Island Rubber Club. Crown Hotel, Providence, R. I.
- Nov. 7. Los Angeles Rubber Group, Inc. Mayfair Hotel, Los Angeles, Calif.
- Nov. 9-10. SAE National Fuels & Lubricants Meeting. The Mayo, Tulsa, Okla.
- Nov. 15. N.A.W.M.D. Pacific Coast Division, San Francisco, Calif.
- Nov. 15-19. National Chemical Exposition. Chicago, Ill.
- Nov. 17. Chicago Rubber Group.
- Nov. 19-21. American Institute of Chemical Engineers. Fall Meeting, St. Louis, Mo.
- Nov. 27-Dec. 2. Sixteenth National Exposition of Power & Mechanical Engineering. Madison Square Garden, New York, N. Y.
- Dec. 5. Los Angeles Rubber Group, Inc. Mayfair Hotel, Los Angeles, Calif.
- Dec. 6-8. National Association of Manufacturers Annual Congress of American Industry. Waldorf-Astoria Hotel, New York, N. Y.
- Dec. 15. Chicago Rubber Group. Annual Christmas Party.
- Dec. 15. New York Rubber Group. Christmas Party. Building Trades Club, New York, N. Y.

Changes Made in OPA Footwear and Tire Regulations

Flat cord soled slabs and soles in the home replacement trade were provided with dollar-and-cent ceilings by Amendment 8 to MPR 477—Sales of Rubber Heels and Soles in the Shoe Factory and Home Replacement Trades—effective October 10. Sales of these slabs and soles in normal times represent less than 1% of total production in the rubber heel and sole industry. For some time even this normally small output was almost completely diverted to the shoe factory trade. Amendment 8 is designed to encourage resumption of the normal trade. Heretofore ceilings were at each sellers' highest March, 1942, prices. The new ceilings for all manufacturers of slabs are established at prices approximately 20% higher than the March, 1942, prices of the principal supplier in the home replacement trade, who indicates that he is willing to make sales at these prices. However the ceilings are lower than the March, 1942, prices of other suppliers. They are, moreover, approximately 25% lower than the corresponding ceilings for sales of these slabs and soles in the shoe factory trade, regarded as the normal differential. Ceilings of the manufacturer who sell the soles by the dozen, and of wholesalers and retailers, are generally at the usual margins over the original manufacturer's ceilings. The industry was consulted in the establishment of the ceilings.

Rubber heel manufacturers who wish to reclassify a heel because it meets the specifications of another price class must suitably mark this heel so that it may be distinguished by the trade and the public from their other heels using the same brand name, according to Amendment 16 to MPR 200—Rubber Heels, Rubber Heels Attached, and Attaching of Rubber Heels—effective October 2. This action is taken to protect both repairmen and the public from being charged a higher price for a reclassified rubber heel because they are unable to determine which is the reclassified heel and which is the heel with a lower maximum price. OPA said that a reclassified heel must bear a V symbol or other distinguishing mark approved by OPA. This symbol or other mark should be reported to OPA when application is made for the reclassification. When no other heels of the same brand name are in any trade channels, approval may be given to a reclassification without the distinguishing symbol or mark.

Amendment 17, effective October 10, reclassifies from "competitive" to "standard" grade the "Ritz" brand heel made by the I. T. S. Co.

Dealers handling rationed rubber footwear must keep ration records until further notice, according to Amendment 14 to RO 6A—Men's Rubber Boots and Rubber Work Shoes—effective September 29. Under the original regulations manufacturers and wholesalers were required to keep sales records, and all establishments had to keep inventory records, for a period of two years. The first inventory records were made shortly after the ration program started, September 29, 1942. Since complete records are necessary to the operation of the program, action is now taken to insure that they will be kept available at least for the duration of the ration order, and longer if necessary.

Orders Affecting the Tire Industry

Tire quotas for October, generally the same as those for September, continued to emphasize the necessity of widespread recapping, not only of passenger-car tires, but

all truck and bus tires as well. The quota of passenger-car tires again enabled ration boards to work off only a small part of their application backlog, in addition to meeting current requests. The backlog was estimated at 800,000 approved applications as of August 31. OPA also emphasized that the heavy-duty truck tire problem would continue serious, with emergency truck tire boards carefully screening applications to take care of essential users first. To relieve a heavy demand, particularly from farmers, for truck tires included in the 7.50 or smaller quota classifications, a supplemental quota of 25,000 tires was authorized for September by the Rubber Bureau.

Following is a tabulation of the October quotas and reserves by tire types, compared with September figures.

TYPE OF TIRE	OCTOBER QUOTAS			SEP- TEMBER QUOTAS
	ALLOCATED	RESERVE	TOTAL	
Passenger and Motorcycle:				
Grade 1 (new tires)	1,483,900	116,100	1,600,000	1,600,000
Truck and Bus:				
7.50 and smaller	253,600	26,400	280,000	280,000
8.25 and larger	83,640	21,360	105,000	102,000
Tractor- Implement:				
7.50 and smaller	46,000	14,000	60,000	55,000
Larger than 7.50	18,400	4,600	23,000	23,000

At the request of the War Department and ORD the automatic expiration date for temporary increases in the ceilings of manufacturers and wholesale distributors of certain rubber tires was changed from October 15 to December 15, 1944, according to Amendment 2 to RMPR 143—Wholesale Prices for New Rubber Tires and Tubes—effective October 14. This two-month extension applies to: (1) specified dollar-and-cent price increases on synthetic rubber passenger-car tires, equivalent to 8.9% of the prewar retail list price for natural rubber tires; (2) price increases on synthetic and natural rubber truck, bus, and industrial equipment tires, equal to 6.5% of the retail list prices. Retail ceilings for these tires are established in dollars-and-cents under the retail tire regulation. They take into consideration these temporary increases in manufacturers' and wholesale ceilings, and, should the temporary increases be taken off, some revision of the retail ceilings will be considered, OPA said.

OPA had provided that the increases would automatically terminate on October 15. Ordinarily no extension would have been made unless manufacturers submitted data on costs to show that a continuation of the increases, in whole or in part, was necessary to make their prices generally fair and equitable. Without submitting such data, however, the Tire and Tube Manufacturers Industry Advisory Committee presented a unanimous resolution to OPA recommending that the temporary price increases be continued for another 60 days. The committee referred to an extremely critical situation existing in connection with the production of large-size truck tires for the Army and said that an attempt by the industry to present adequate cost data to OPA before October 15 would interfere with the production of these urgently needed truck tires.

OPA said that the temporary price increases will not be extended beyond De-

cember 15 unless before that time adequate data are supplied by the tire manufacturers to indicate that some extension of the increases is necessary to comply with the requirement of the Price Control Act that maximum prices be generally fair and equitable.

Temporary retail ceilings for new off-the-road tires made with rayon fabric, previously established for the period August 10, 1944, to October 15, 1944, will be continued in effect until December 15, 1944, under Revised Order No. 10 of MPR 528—Tires and Tubes, Recapping and Repairing—effective October 14. Ceilings for these tires, used principally on road construction equipment, are 112½% of the already established maximum prices for the same type, size, and ply new tires made with cotton fabric. Dollar-and-cent ceilings for cotton fabric tires are listed in MPR 528. OPA pointed out that manufacturers already have been granted permission to continue using until December 15, 1944, temporary price increases on these tires as well as on other types of tires, which previously also had been scheduled to end October 15, 1944. OPA further said that the question of ceilings for off-the-road tires made with rayon fabric is part of the general problem relating to the level of maximum prices for all sales of civilian replacement tires, which will be reconsidered before December 15.

Order 14 establishes maximum retail prices for certain sizes of Atlas new natural rubber passenger-car inner tubes purchased from the Standard Oil Co. (Indiana), Chicago, Ill.; while Order 15 sets retail ceilings for specified sizes and types of new Jumbo Junior Industrial tires made by The General Tire & Rubber Co., Akron, O.

Order 16 (October 25) gives the maximum retail price for a new 11.00-22, 14-ply truck tire made by Dayton Rubber Mfg. Co., Dayton, O.

Amendment 6, MPR 435—New Bicycle Tires and Tubes—effective October 28 indicates that the regulation applies to the 48 states, the District of Columbia, and all the territories and possessions of the United States.

Tire manufacturers, after September 28, under certain conditions, may transfer a limited number of new truck tires to dealers without obtaining ration certificates from the dealers, under Amendment 88 to RO 1A—Tires, Tubes, Recapping and Cambleback—in order to facilitate the movement of new truck tires from manufacturers to dealers, with some improvement in distribution and service to consumers.

Amendment 2, Rev. RO 1C—Tire Rationing Regulations for the Virgin Islands—effective October 1, removes inner tubes from rationing restrictions.

Amendment 11, RO 1B—Mileage Rationing: Tire Regulations for Puerto Rico—issued October 16, makes changes in the table covering eligibility for tires determined by type of ration and adjusted weekly mileage.

Other OPA Rulings

Supplementary Directive 1Q, as Amended October 6, 1944—Rationing of Tires, Tire Casings, Tire Tubes, Gasoline, Naphtha, Etc.—among other changes, defines gasoline as "any petroleum product either commonly known or sold as gasoline (including casing-head and natural gasoline) or having an ASTM 50% distillation point lower than 400° F. (ASTM D86-40), and includes, without limitation, rubber solvents, mineral spirits, cleaners' naphtha, Stoddard solvents, stove and lamp naphtha, and V. M. & P.

naphtha, but does not include, (i) fuel oil as defined in Ration Order 11, (ii) aromatics, synthetic rubber raw materials and other products which are both controlled by an order of the War Production Board and not used or blended for use as fuel in internal combustion engines, (iii) any finished petroleum product having an octane rating of 85 or more (ASTM D357-42T) or any component thereof, used for the propulsion of aircraft, and (iv) liquefied product of petroleum gases."

Order 37, MPR 149—Mechanical Rubber Goods—effective October 18, increases manufacturers' ceilings of hard rubber SLI battery containers by 10%, covers 15%, and vents 15 to 30%. This action was adopted to aid production of these items by helping manufacturers meet increased costs occurring since January, 1942, when maximum prices were established. As no changes have been made in the ceilings of the finished batteries, battery manufacturers who are the purchasers of the containers, covers, and vents are expected to absorb the increases.

Amendment 5, MPR 406—Synthetic Resins and Plastic Materials and Substitute Rubber—effective October 21, adds a new section to the regulation to permit applications for adjustment with respect to specified synthetic resins and plastic materials where the manufacturer's ceilings therefor subject him to substantial hardship. The synthetic resins affected are those containing 50% or more of gum rosin, which latter ingredient has risen in cost.

In keeping with its announced policy of easing reporting requirements whenever possible without raising a threat to effective price control, OPA announced September 30 that provisions that required sellers of used machinery and machine tools to file inventory and sales reports have been suspended for 90 days, from October 1 to December 31, 1944. (Amendment 6 to MPR 1—Second-Hand Machine Tools; Amendment 125 to Amended MPR 136—Machines and Parts and Machinery Services; Amendment 4 to MPR 375—Sales of Used Industrial Sewing Machines and Rental Rates for New and Used Industrial Sewing Machines; and Amendment 6 to MPR 465—Used Pressure Vessels and Used Enclosed Atmospheric Pressure Vessels—all effective October 2.) As part of an inter-agency program, field offices of the WPB Redistribution Division collected these inventory and sales reports for OPA, but WPB disbanded this division, effective September 30. The suspension of the filing requirements does not mean that there will be any relaxation of price control on these commodities, OPA emphasized.

The new Scrap Rubber Repair Materials Industry Advisory Committee was scheduled to hold its first meeting October 31 in Washington, D. C., to discuss a proposed schedule of dollar-and-cent ceiling prices, at all levels of distribution, on tire boots, patches, and liners made from scrap rubber, to replace formula or freeze ceilings on these items. Ceilings for manufacturers and jobbers are under RMPR 131—Camelback and Tire and Tube Repair Materials. Retail ceilings are established under the General Maximum Price Regulation at present, and the proposed dollar-and-cent retail ceilings would be put under MPR 528. The committee for the manufacturers and jobbers follows: Abe Lowenstein, Alligator Rubber Products Co., Newark, N. J.; Nathan Lakin, A. Lakin & Sons Inc., Chicago, Ill.; S. L. Greenfield, Greenfield Mfg. Co., Baltimore, Md.; A. Warsaw, Vulcanizers Material Co., Grand Rapids, Mich.; Irving

Levin, Superior Iron & Metal Co., Jacksonville, Fla.; M. L. Prather, Oregon Tire Patch Mfg. Co., Portland, Oreg.; Ben Goldman, Tire Salvage Co., Los Angeles, Calif.

Cost increases in the toy industry resulting from changes from the use of crude to synthetic rubber in many types of toys, and increased costs of wood, were discussed at a recent meeting of the Toy Industry Advisory Committee to OPA. Officers were elected, and six task committees were appointed to make studies of their particular segments of the trade. Chairman for rubber toys is Tom Smith, of Sun Rubber Co., Barberton, O. OPA was urged to undertake immediately a study of the industry to insure that regular toy manufacturers may return to production of toys as soon as they are authorized to do so, without delays over the settlement of pricing problems.

WPB Order Changes

Balata, imported mainly from Brazil, on October 2 was removed from R-1 and transferred to General Imports Order M-63. Placing balata on Order M-63 provides restrictions on the maximum amount allowed for importation into this country during a calendar year, thus making possible a fuller use of labor in producing the more important natural rubber for the war effort, WPB stated. Previously this commodity had been imported under a public purchase program of the Rubber Development Corp., a subsidiary of the Reconstruction Finance Corp. WPB said that labor used in the production of balata can also be utilized in the natural rubber production program being conducted in the same Latin American area.

Conservation Bulletin No. 13, of February 21, 1944, was suspended October 7 in a notice prepared by the Operating Committee on Aircraft Materials Conservation and approved by joint action of the Army Air Forces, Navy Bureau of Aeronautics and the Aircraft Resources Control Office, Aircraft Production Board. Since the issuance of Bulletin 13 the availability of all-purpose neoprene, including GR-M and Neoprene Type GN-A (replacing Type GN) is such as to be available for all essential aircraft uses. Besides special types of neoprene, as the various neoprene latices and Neoprene Type FR, are available for aircraft applications requiring their special properties. R-1, as amended August 25 Code 12A, moreover, permits the use of neoprene and other synthetic rubbers for all aircraft equipment.

Conservation Order M-124, the rubber yarn and elastic thread order, has been amended to extend the date from October 1 to December 1, 1944, when the restrictions of the order become applicable to synthetic rubber yarn and synthetic rubber thread. Extension of the effective date is made possible because current production of synthetic rubber thread has proved sufficient to meet current requirements, WPB stated.

Since sufficient supplies of equipment used for retreading, recapping, and repairing most sizes of civilian tires are now available, WPB announced October 23 that it had revoked Order L-61. Under L-61 dealers had been permitted to extend their MRO (maintenance, repair, and operating supplies) rating to obtain replacements. Now, however, dealers are deprived of the right to extend their MRO rating to purchase equipment for smaller-size tires. Except in the case of replacement equipment for truck tires of size 8.25 by 20 and larger, dealers will now

place unrated orders, which will be filled in sequence, provided the supplier has first filled all outstanding rated orders and has satisfied all military requirements.

Because of a shortage of specialized equipment for recapping truck tires of size 8.25 by 20 and larger, a new provision has been inserted in Priorities Regulation No. 3, giving specific permission for firms to extend their MRO rating to obtain replacements for this type of equipment, WPB said.

Though L-61 is revoked, the manufacture and delivery of tire retreading, recapping and repair equipment remains subject to all other applicable WPB orders and regulations.

Limitation Order L-277—Fountain Pens and Mechanical Pencils—was revoked September 25, but manufacture and delivery of these products remain subject to other applicable WPB regulations and orders.

The Toy Manufacturers Industry Advisory Committee expects availability of materials for toy manufacture to be a bigger factor in the reconversion of the industry than the problem of changing over equipment, WPB reported. Committee members, at their recent meeting, said manufacturers may experience difficulty in obtaining sufficient quantities of lumber, textiles, rubber, leather, and paperboard, which are expected to remain critical even after the defeat of Germany. WPB officials pointed out that controls would be retained over materials remaining in short supply after this defeat. Most segments of the toy industry will be able to reconvert facilities and resume production of toys within 30 to 90 days after permission is granted, the committee estimated. However, reconversion of facilities for rubber toy production might require more than 90 days after rubber becomes available.

Allocation Order M-226—Dichlorethyl Ether—was revoked as of October 1 because of the sufficient supply of the commodity. Also revoked, as of November 1, was Conservation Order M-319—Manufactured Abrasive Grain.

The following orders have been revoked and their respective products placed under General Allocation Order M-300: M-10—Vinyl Polymers; M-304—Adipic Acid; M-139—Phthalic Alkyd Resins; M-153—Acrylonitrile; M-348—Polyethylene.

Special Report

(Continued from page 190)

has to be remilled and repacked—operations which might cost 2½¢ per pound. Allowing for these inescapable items of expenditure, the figure of cost given by the witness before the Truman Committee would leave the poor 'native' producer with nothing but the certainty of loss."

The memorandum went on to say that "costs of a particular class of producer or of a hypothetical average producer were not only inaccurate but also irrelevant", and that (in the effort for maximum production) "it was essential to bring in every class of producer, whatever his category and that could only be done by fixing the price at a level which was profitable to all. The basic price was, in fact, fixed at 18 to 20¢ per pound c.i.f." In this paragraph, the Committee therefore recorded its opinion that a delivered price of 18 to 20 cents New York was profitable to all producers in 1940-1941.

(To be continued)

EASTERN AND SOUTHERN

R. M. A. Reelects Viles; Lockwood in New Post

The Rubber Manufacturers Association, Inc., 444 Madison Ave., New York, N. Y., at a board meeting September 26 reelected A. L. Viles president. To assist him in the administrative duties of the Association, the board also named Warren S. Lockwood to the newly created office of executive vice president.

Mr. Viles pointed out that the increase in administrative personnel was quite necessary to meet the industry's increasing demand for service now and in view of postwar problems.

The board met following the annual meeting, and the following directors were reelected: F. B. Davis, Jr., chairman of board, United States Rubber Co.; C. D. Garretson, president, Electric Hose & Rubber Co.; J. P. Seiberling, president, Seiberling Rubber Co.; Harry E. Smith, general manager, Manhattan Rubber Mfg. Division, Raybestos-Manhattan, Inc.; J. Newton Smith, president, Boston Woven Hose & Rubber Co. Other directors are: E. S. Boyer, chairman of board, American Hard Rubber Co.; John L. Collyer and J. J. Newman, president and vice president, respectively, B. F. Goodrich Co.; Geo. B. Dryden, president, Dryden Rubber Co.; E. B. Germain, president, Dunlop Tire & Rubber Corp.; P. W. Litchfield and E. J. Thomas, chairman of board, and president, respectively, Goodyear Tire & Rubber Co.; T. W. Miller, chairman of board, Faultless Rubber Co.; William O'Neil, president, General Tire & Rubber Co.; and Herbert E. Smith, president, United States Rubber Co.

Mr. Lockwood, a graduate of Dartmouth College in 1929, served as an officer of the Trade Commissioner Service of the United States Department of Commerce in Singapore, Batavia, Washington, D. C., and London from 1929 through 1938. In Malaya, Java, and Sumatra, Mr. Lockwood specialized in rubber production studies. In Washington in 1933 and 1934 he worked on trade controls and trade agreements program. In London, from 1935 to 1938, he reported on the operation of the International Rubber Regulation Committee and handled rubber and tire matters for the American Embassy.

Mr. Lockwood resigned in 1938 and following an extensive survey of rubber product developments in France, Germany, Austria, Holland, and Czechoslovakia, became director of the Crude Rubber Development Bureau in Washington, an organization financed by the rubber producing industry and devoted to research into and publicity for new rubber uses. Special attention was paid to the use of rubber tires on farm tractors and other farm equipment items. The Bureau was closed in 1939 because of war conditions. Then on January 1, 1940, Mr. Lockwood joined the R. M. A. and, in addition to continuing agricultural tire studies, served as chairman of the footwear rubberized materials, and hard rubber divisions.

In June, 1942, he was appointed administrative assistant of the Rubber Reserve Co. in Washington, but on October 1, 1943, joined the Department of State, and returned to the American Embassy in London as rubber attaché. Last spring, on a special mission for the State Department, Mr. Lockwood visited Australia, Ceylon, and India, returning to Washington by way of London. He represented the Embassy during the exploratory postwar

rubber talks held with the British and Dutch in London in August.

Dewey and Tompkins Honored

A testimonial dinner to Bradley Dewey, former Rubber Director, and L. D. Tompkins, former Deputy Rubber Director, was given September 26 by the R. M. A. Directors in behalf of the rubber industry, at the Waldorf-Astoria, New York, to express the appreciation of the rubber industry for their great service during the critical war period. Colonel Dewey and Mr. Tompkins paid tribute to their former associates in the Rubber Director's Office, several of whom were present at the dinner, and spoke of the fine cooperation between the industry and government which had made possible the creating of a synthetic rubber program sufficient to take care of all essential military and civilian needs.

Shoe Solings Exhibited

"Rubberlyke", a plastic soling was presented by a group of manufacturers at a buyers' exhibit of shoes at the Hotel New Yorker, New York, N. Y., October 1 to 3. Elliot E. Simpson, the inventor, said that the soling was made of non-critical chemicals and that one of the constituents was similar to soya bean. "Dense sponge" platform soles of reclaimed rubber were also shown by this group of manufacturers which included: Norwalk Tire & Rubber Co., Norwalk, Conn.; American Rubber Products Corp., La Porte, Ind.; Atlantic Tubing & Rubber Co., Cranston, R. I.; and L. Drexsage Co., Simpson's Walker-Woods, Inc., New York Rubber Brokerage Co., T. A. Maguire & Co., Inc., Rubber Brokers, Inc., and Raya Plastic Products, all of New York.

United Carbon Co., Inc., Charleston, W. Va., has announced that John E. Brothers, formerly chief chemist of the Dill Mfg. Co., Cleveland, O., and late technical assistant of the Rubber Reserve Co., Washington, D. C., has joined its staff as supervising chemist of the Charleston research and development laboratories.



John E. Brothers

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., on October 2 announced that its rubber chemicals division will establish a branch office and completely equipped technical service laboratory in Akron. Harry A. Hoffman, Akron representative of the company, will be manager. A two-story office building at 311-15 S. High St., has been purchased and will be remodeled for the installation of office and modern testing and service equipment. It is expected that the new facilities will be ready early next year. Purpose of the laboratory is to furnish technical service to the DuPont company's many customers among the rubber manufacturers in the Midwest.

Du Pont Aide Sees More Jobs Through Research

New projects and products developed for postwar civilian production together with increased outlets for existing products are expected to bring to an all-time high the company's peacetime employment, Cole Coolidge, assistant chemical director, said in an address, "Research Makes Jobs", October 16 at the Herald-Tribune Forum in the Waldorf-Astoria Hotel, New York, N. Y. He expressed the belief that "the great research laboratories which have been established in America since the last war represent a national asset of extreme importance in the solution of future problems, particularly the problem of providing adequate employment at our high American standards." Analyzing the importance of research in the prewar period, Dr. Coolidge pointed out that 46% of the company's gross sales in 1942 consisted of products that either did not exist in 1928 or were not then manufactured in large commercial quantities. Stating that thousands of new chemical compounds have come from 3,400 industrial laboratories in the chemical field employing more than 70,000 research workers, he concluded that the du Pont company was not alone in the anticipation of maintaining high levels of employment in the postwar period.

Glyco Products Co., Inc., 26 Court St., Brooklyn 2, N. Y., has opened a factory and offices in Mexico City. The Mexican company, known as Productos Químicos Glyco, S.A., is located at Cipres Num. 355, Mexico D.F., Mexico, and is under the direction of E. Rios and A. Graf, both eminent Mexican chemical engineers of considerable experience. This company is manufacturing many of the products of the American parent company, particularly those which can be made from Mexican raw materials. It is also acting as exclusive sales agents for all the other products manufactured by Glyco Products Co., Inc., which are not at present being produced in Mexico.

The Barrett Division, Allied Chemical & Dye Corp., 40 Rector St., New York, N. Y., recently announced construction plans for a new plant at Ironton, O., which will be devoted primarily to the distillation of coal-tar for the recovery of various chemicals.

General Atlas Carbon, Pampa, Tex., recently announced that demand for Pelletex and Gastex, semi-reinforcing furnace blacks, has led to a recent major addition to the Pampa plant which will increase the annual capacity of Pelletex by 20 million pounds. Vice President Carl J. Wright stated that the new producing units will be placed in operation as rapidly as wartime restrictions on labor and materials permit.

U. S. Rubber Advances Sturtevant and McDermott

F. W. Sturtevant has been appointed technical sales representative of the Latex and Lotol department, Naugatuck Chemical Division, United States Rubber Co., 1230 Sixth Ave., New York 20, N. Y., according to Arthur Nolan, sales manager of the department. Mr. Sturtevant will also represent the company's affiliate, Dispersions Process, Inc., and will technically service Naugatuck's licensees under the Koloc process of textile and fiber treatment to reduce shrinkage and improve wear resistance. His territory will include New York, Pennsylvania, New Jersey, Delaware and Maryland, with headquarters at Naugatuck, Conn. Since joining Naugatuck Chemical in 1936, Mr. Sturtevant has been active in developments of Koloc and in the production of textile products employing aqueous dispersed rubber in their manufacture. Born at Lowell, Mass., Mr. Sturtevant had early contact with the textile manufacturing and finishing industries in local mills and was graduated from Lowell Textile Institute as a textile chemist. His first work was with *Textile World* on its technical editorial staff at Boston, Mass. In 1928 he became associated with Better Fabrics Testing Bureau at the time of its establishment at Washington, D. C., and later organized and staffed a laboratory for this concern in New York. For several years Mr. Sturtevant was at the Gilford Main Mill of the Old Town Woolen Co. as chemist and dyer of woolen blankets and piece goods.

Henry C. McDermott has been made general sales manager of Gillette Tires, division of U. S. Rubber, according to J. W. McGovern, general manager of the tire division. Mr. McDermott brings to Gillette an experience of more than 28 years in the rubber industry. Joining the U. S. Tire organization in December, 1932, he was appointed Cincinnati district manager in 1934 and later he became manager of the automobile tire department in the company's general offices in New York. Subsequently he directed tire advertising and sales promotion. Then in June, 1936, he was promoted to sales manager of the company's Chicago division and later of the New York division. In 1940 he was again advanced, to become general sales manager of the Fisk Tire sales division and served as such until he was called upon to organize the company's government tire activities and to represent the company in its relations with all government agencies responsible for the procurement of tires for the Armed Services, Lend-Lease, and various civilian bureaus.

Herbert E. Smith, president of U. S. Rubber, has been appointed chairman of the Industry Section of the Sixth War Loan campaign for New York, N. Y. This section embraces 35 industries, including rubber, automotive, aviation, and petroleum. Mr. Smith will also serve as chairman of the rubber industry. The campaign, with a national goal of \$14,000,000,000, is scheduled to start November 20.

Gilmer Company Bought

U. S. Rubber has agreed to purchase the assets and business of the L. H. Gilmer Co., Philadelphia, Pa. Founded in 1907 and employing approximately 600 people, Gilmer lists among its chief articles of manufacture besides V-belts such products as automobile fan belts, rubber covered rolls, and industrial truck wheels and other related items. A major part of the company's current production is for the war effort. Herbert E. Smith, U. S. Rubber

head, said that the purchase was made to round out further the mechanical goods division of his company. He added that no change in the management or operations of the Gilmer company is contemplated. John S. Krauss, president, will continue in the active management of this business.

New Developments

A water storage tank, made of glass fabric coated with synthetic rubber, to provide combat troops in the Pacific with a supply of pure drinking water has been developed by U. S. Rubber, working closely with the Army Corps of Engineers. The tank, now in production at four of the company's plants, is said to be not affected by rot or mildew, to resist fungus growth, to be completely watertight, and non-toxic, and to give no objectionable taste or odor to water. Light in weight, strong, and durable, the tank is easy to transport and set up in the field because it is collapsible and can be compactly folded. It is 54 inches high and more than 11 feet in diameter and will hold 3,000 gallons of water. Each tank is shipped complete with instruction manual, repair kit, all necessary fittings, ground cloth for added protection to bottom of tank and top cover to keep foreign matter from dropping into the water. Wood staves are used to keep the sides of the tank upright, and guy ropes on these staves prevent the tank from collapsing after it is emptied.

Flotofoam, a buoyant plastic foam, produced by foaming and solidifying a combination of synthetic plastic materials is being manufactured for war uses, according to U. S. Rubber. The semi-rigid material weighing less than a pound and a half per cubic foot has good insulation and sound-deadening properties in comparison to its weight because of the air space it contains.

Visitors to the recent Textile Exhibit of U. S. Rubber at the Biltmore Hotel, New York, saw cotton processed on mill machinery and a display of new products for postwar markets. Particular interest centered around Asbestos, a heat-resisting material containing cotton and asbestos, originally developed for war products, which can be made into ironing board covers that will not burn and into flameproof draperies in colors to match any decorative scheme. Officials of the company attending the show

said that cotton will continue in the forefront of fibers used in the manufacture of rubber goods because of its strength and versatility.

Announcement was also made by the company of the opening on October 1 of a new textile mill at Scottsville, Va., but lack of equipment is expected to prevent capacity production for some little time.

The Alice Mill of U. S. Rubber in Woonsocket, R. I., began on October 16 a limited production of rubber footwear for civilian consumption preparatory to larger scale production once the war with Germany is ended, according to W. E. Bittle, factory manager. He stated that probably 95% of the factory's output would still be for military purposes, but that it was felt desirable to get equipment into working shape for a quick switch to civilian work when war conditions permit.

Postwar Dutch Rubber Prospects

An optimistic opinion for both short and long range prospects for natural rubber was expressed by W. P. Hasselman, trade commissioner of Netherlands India at a meeting of the Rubber Trade Association of New York, Inc., September 14. He did not believe, Mr. Hasselman said, that the plantations have been destroyed to any great extent by the Japanese. Some stocks of rubber are expected to be found when the islands are reoccupied. Large supplies of rubber have stimulated the Japanese to numerous experiments, but little value can be attached to the propaganda statements of the invaders that they are finding other than conventional uses for rubber, the commissioner stated.

In the first stages of the rehabilitation of raw rubber production, the Netherlands India Government will perform the functions of exporter, Mr. Hasselman said and added that no plans had been made beyond this initial stage for conducting the rubber export trade of the islands. Because the necessary retooling of processing plants will involve considerable cost, he pointed out that the plantations are desirous of knowing whether rubber requirements will conform to prewar R. M. A. standards or to new specifications brought about by technological developments.

During the first few years of peace rubber—synthetic and crude—will not be overplentiful, Mr. Hasselman declared. He then concluded:

"After the first great rush to resupply the world with things that are made of rubber, there will undoubtedly be a lessening in the demand, and a time will come for re-appraisal of the producing plants for both natural and synthetic rubber. I believe that such an appraisal will be based on sound economy in both cases, and that the sound synthetic plant and the sound natural plant will both survive as prosperous components of the raw rubber industry."

The Neville Co., Pittsburgh 25, Pa., has made Lyle M. Geiger director of research, according to President H. N. Dauler. Associated with Neville for several years, Mr. Geiger has contributed to the company's work in synthetic resins, solvents, and oils used in various grades of rubber and rubber products. In plastics, he broadened the application of the Nevillac resins and plasticizing oils. His work in



W. O. Breckon

L. M. Geiger

Nevillac resins and in Nevilloid resin emulsion also proved useful in the textile, lacquer, paint and varnish, adhesives, waterproofing, shoe, leather finishing and ink industries. Mr. Geiger supervised Neville's development of a rare chemical compound for certain types of artillery shells, helping break an early war bottleneck. He was active in developing Nextex, a waterproofing agent for use in the sub-normal temperatures encountered in some war theaters. In the development of Neville's experimental pilot plant, which has speeded solution of numerous special chemical problems brought to the company by industrial war producers, Mr. Geiger took a major part. This unit continues under his direction. Mr. Geiger has served as acting director of research at Neville for the past year and a half. He is a graduate of Lehigh University in chemical engineering and a member of the American Chemical Society and of the Pittsburgh Section, Federation of Paint & Varnish Production Clubs.

Heyden Chemical Corp., 393 Seventh Ave., New York 1, N. Y., has acquired as patent attorney Ferdinand F. E. Kopecky. A graduate of Rutgers University who has done post-graduate work at both Rutgers and Harvard University, Mr. Kopecky started his professional career as a research chemist with Bakelite Corp. and was with Ellis Laboratories and Monsanto Chemical Co. in chemical capacities. More recently he acted as patent attorney for Monsanto and Phillips Petroleum Co.

Brake Lining Manufacturers' Association, Inc., 370 Lexington Ave., New York, N. Y., at its annual meeting on October 4, elected the following to office for the year beginning September 1, 1944: president, J. S. Doyle, Johns-Manville Corp.; first vice president, C. Q. Smith, American Brakeblok Division, American Brake Shoe & Foundry Co.; second vice president, W. E. Harvey, Thermoid Co.; treasurer, V. A. Spina, Scandinavia Belting Co.; secretary and assistant treasurer, H. G. Duschek, Brake Lining Manufacturers' Association; executive committee, J. G. Brown, Grizzly Mfg. Co.; R. B. Davis, Raybestos Division of Raybestos-Manhattan, Inc.; F. A. Miller, United States Asbestos Division of Raybestos-Manhattan; A. P. Smith, Russell Mfg. Co., and H. C. Berkeley, Inland Mfg. Division of General Motors Corp.

Lee Rubber & Tire Corp., Conshohocken, Pa., according to President A. A. Garthwaite, plans enlarging its tire manufacturing plant to handle record backlog of tire orders for war purposes and also the heavy potential postwar business. The board has appropriated sufficient funds for the purpose.

Hercules Powder Co., Wilmington, Del., held Open House on October 26 and 27 for a group of editors of those technical and trade magazines which represent industries now using, or likely to use in postwar years, Hercules chemical materials. The purpose of the meeting was to acquaint the readers of these publications with the work that Hercules has been doing in the war effort and what this company is planning for the postwar. A report of this event will appear in the December issue of INDIA RUBBER WORLD.

Thiokol Corp., Trenton, N. J., has elected Joseph W. Crosby president and a director. He had been general manager of the company following the death of the former president and founder, Bevis Longstreet, last year. Also elected to the board at the special meeting was J. W. Britton, of Dow Chemical Co., Midland, Mich. The resignation from the board of E. Emmett Reid was regrettably accepted at the same time.

American Management Association on September 27-29 at the Hotel Pennsylvania, New York, N. Y., held a conference on "Preparing for Manpower Reconversion" at which existing employment problems and those likely to arise after the defeat of Germany were discussed by industrial executives and government officials. More than 2,000 industrial relations executives attended the sessions. Speakers included Paul V. McNutt, WMC chairman, Major General Lewis B. Hershey, director, Selective Service System, and William M. Leiserson, formerly of the National Labor Relations Board. Panel discussions were held on "The Foreman in Labor Relations", "Clinic on Clauses in Collective Bargaining", and "Personnel Policies of Reconversion."

Givaudan-Virginia, Inc., 330 W. 42nd St., New York 18, N. Y., has announced that Charles P. Wilson, Jr., formerly of the WPB Chemical Section, has joined its staff to handle the sales of anhydrous aluminum chloride.

Wilmington Chemical Corp., 10 E. 40th St., New York, N. Y., has named as chief chemist Hubert I. du Pont, connected with the company since its inception and for the last three years in charge of chemical engineering research at the company's laboratories. He succeeds Fritz Rostler, who has been appointed research professor of chemistry in the engineering experiment station of the University of Delaware, where he will conduct research on selected problems of industrial interest in the fields of petroleum and rubber. Dr. Rostler, known as the inventor of Naftolen and as the original advocate of the use of unsaturated hydrocarbon extenders in rubber compounding, will continue, however, to be associated with the Wilmington company in a consulting capacity.

Foster D. Snell, Inc., consulting chemist and engineer, 305 Washington St., Brooklyn 1, N. Y., has made many additions to its staff, including Frank Celauro, formerly with American Cyanamid Co., in the analytical department; John Swidinsky, recent chemist at Calco Chemical Co., in the development division; and Ellen Schuster and Albert M. Stover, for three years a research chemist with The B. F. Goodrich Co., doing research in the rubber and plastics department.

Foster Dee Snell recently addressed the Rotary clubs of Brooklyn and of Glen Cove on postwar uses for wartime substitutes. Dr. Snell believes that after the war, because of the slow return to production of the rubber plantations and possible natural destruction of some plantations, somewhat in excess of 50% of United States requirements for rubber would be met with by synthetic rubber, since the latter can and will be tailored to fit many jobs where natural rubber has proved less satisfactory.

Standard Oil Development Co., New York, N. Y., has elected R. P. Russell, since 1937 executive vice president of the company, which he had joined in 1927 after an assistant professorship at Massachusetts Institute of Technology, president to succeed Frank A. Howard, who resigned effective October 6, but who will remain a director of the Development company and vice president of Standard Oil Co. (N. J.) until after the new year, when he expects to resume private law practice. Then he will serve the company as patent counsel.

Also announced was the election as a vice president of the Development company of W. R. Carlisle, with the firm since 1930.

The purchasing department of Standard Oil of N. J. on October 30 moved from 26 Broadway to the ninth floor, 115 Broadway, New York 6.

John A. Roebling's Sons Co., Trenton, N. J., at its regular board meeting on September 28 elected Charles Roebling Tyson president, Joseph M. Roebling chairman of the board, Archibald W. Brown treasurer, and H. D. Rathbun secretary and assistant treasurer. Mr. Tyson, who, at the age of 30, succeeds the late William A. Anderson, became associated with the company in 1935 and worked in various manufacturing departments, becoming secretary-treasurer in 1940. Joseph Roebling, now serving abroad as a lieutenant in the United States Army Air Corps, has been first vice president of the company since 1936. Lt. Col. F. W. Roebling, III, of the U. S. Army Corps of Engineers, continues to hold the office of vice president of the wire products company.

Comprehensive Fabrics, Inc., 350 Fifth Ave., New York, N. Y., has signed C. D. Couch, Jr., as merchandise manager as part of the company's preparations for greatly expanded postwar merchandising activity in goods made of Koroseal. Mr. Couch formerly had been director of product applications for the Celanese Corp. plastic division.

Appointment of John H. Miller as manager of advertising and sales promotion for Comprehensive Fabrics was announced October 22 by Karl F. Egge, secretary, treasurer, and director of public relations for the company. Mr. Miller recently resigned a similar position he had held for the last four years with the Mennen Co. Previously he had been in the advertising agency business in New York and before that was institutional advertising manager for L. Bamberger & Co.

Pittsburgh Plate Glass Co., 632 Duquesne Way, Pittsburgh, Pa., has recalled Clarence M. Brown, Philadelphia attorney, as chairman to fill the vacancy created by the death of H. S. Wherrett. Leland Hazard, general counsel, was elected vice president; H. B. Higgins, president, was named chairman of the executive committee, and H. B. Brown, secretary, was elected to the board.

President Higgins, in announcing the elections, reported the company expects little difficulty in reconverting to peacetime work after the war ends. In addition to enlarging the output of many old line products, he said his concern will add several new ones which have been developed during the search for materials to replace those cut off by the war.

OHIO

Firestone Transfers Handley

E. T. Handley, general manager of synthetic rubber operations for The Firestone Tire & Rubber Co., Akron, has been named manager of the new \$4,500,000 tire plant that the company is building for the government and will operate at Des Moines, Iowa. Mr. Handley came to Firestone in 1927 in the rubber compounding division. He was transferred to Buenos Aires, Argentina, in 1931 as assistant production manager of the company's plant there and in 1935 became production manager of the Firestone plant in Switzerland. He took charge of the company's synthetic rubber operations in 1941 and operation of plants which the company operates for the government at Akron, Port Neches, Tex., and Lake Charles, La.

K. K. Wyatt, manager of the synthetic rubber plant at Port Neches, now becomes general manager of the company's synthetic rubber operations. Mr. Wyatt, a consulting and construction engineer, joined Firestone in 1942 after serving in executive and consulting capacities for several large American companies.

Other Personnel News

An Army Ordnance citation for distinguished service in the war was awarded last month to J. E. Trainer, vice president in charge of production at Firestone, for his work as assistant chairman of the Intermediate Caliber Antiaircraft Carriage Industry Integrating Committee since January, 1943.

T. G. McGowan, manager of marketing research for Firestone and head of its postwar planning committee and chairman of the marketing committee of the Committee of Economic Development, stressed the need of increased study of distribution problems as they relate to the necessity of high employment in the postwar period, at the Boston Conference on Distribution, held at the Hotel Statler, October 16 and 17.

Roy W. Brown, speaking October 6 at the National Aeronautic Meeting of the Society of Automotive Engineers at the Biltmore Hotel, Los Angeles, Calif., said that although air was the ideal elastic support for planes while taxiing, rubber was a close second. Mr. Brown said that for small planes a molded rubber cylinder containing oil had been found satisfactory. The walls of the cylinder function as rubber springs, and the device combines the advantages of air spring, rubber spring, frictional material, and oil absorption. Rubber springs were described as meriting serious consideration, with combinations of oil, and rubber disks vulcanized to metallic disks, offering many advantages.

Homer E. Ludwick, controller of the Firestone Tire & Rubber Co., Los Angeles, Calif., was elected a director of the Controllers Institute of America, 1 E. 42nd St., New York 17, N. Y., at its thirteenth annual meeting.

New Firestone Products

Firestone announced recently the development of a "heat-tempered" plastic tire in which the "tempering" is achieved by adding certain materials to the plastic and applying heat. The new tire, which is not soluble in gasoline or oil and does not crack or check in sunlight, is expected to



New (left) and Old Type Gas Masks

withstand twice the heat a natural rubber tire develops at high speeds. It is now undergoing laboratory tests.

Manufactured by the Firestone war products division at Fall River, Mass., a new gas mask developed by the Chemical Warfare Service Development at the Massachusetts Institute of Technology has been used on the beaches of Normandy. The assault mask is a complete unit itself with the canister attached directly to the face blank on the left cheek. A waterproof synthetic rubber carrier attached on the left hip permits freedom of movement in action. Facepiece, canister, and carrier weigh about 2.8 pounds as compared to a nine-pound weight of the original service mask with unwieldy rubber hose tube and cumbersome carrier containing the canister.

Two films, "Freedom Rides on Rubber" and "All Out for Victory", for both 16 and 35 millimeter projectors, are available to church, educational, civic and similar groups without cost from the Firestone company. These films were shown at the Firestone War Products Exhibit in New York, N. Y., and other cities.

Tests by research men of the Firestone company on a rubberized glove captured from the Japanese in the Aleutian Islands showed the glove, which appears to be made entirely of rubber, to have a very thin fabric insert which gives it extreme durability. Adhesives used to cement the various parts compare favorably with top-quality products of American companies. Reaching to the armpits, the glove apparently was designed to provide warmth and possible protection in gas warfare.

Paul M. Gunsaulus, service sales manager of the Pharis Tire & Rubber Co., Newark, speaking at a recent postwar conference of the Michigan Petroleum Association said that it was believed that in the first postwar year the tire replacement market will require 55,500,000 passenger tires. An original equipment market for 30,000,000 passenger car tires is anticipated.

Warning that the future of synthetic rubber cannot now be predicted, Mr. Gunsaulus declared, "Synthetic rubber is just another drain on the petroleum resources of the nation and those in the oil industry are making more and more different products out of petroleum, but you, as distributors of gasoline, and we, as manufacturers of tires, must insist that gasoline come first."

Goodyear Announcements

The Goodyear Tire & Rubber Co., Akron, has returned A. C. Michaels to his prewar post of superintendent of the Gadsden, Ala., plant. Since July, 1944, he had been superintendent of the Arizona division of Goodyear Aircraft Corp., a post now held by C. E. Titus, manager of the modification department.

R. W. Maney, Mr. Michaels' successor as Gadsden superintendent, returns to Akron as superintendent of Plant 1; while E. T. Ruffner transfers from that position to the superintendency of Goodyear's new tire plant in Topeka, Kan. He had been superintendent of the company's plant in Java prior to Pearl Harbor.

Appointment of R. A. McCorkle as manager of the newly created seaboard division of The Goodyear Export Co., a subsidiary of Goodyear Tire & Rubber, was revealed last month. Mr. McCorkle will represent the company on the eastern seaboard in all matters pertaining to export business. Managing director of The Goodyear Tire & Rubber Co. of India, Ltd., since 1935, Mr. McCorkle has had a long and varied service record with Goodyear. He started with the company in 1913 in truck tire sales, later transferred to manufacturers' sales, and was Detroit sales representative. He went with Goodyear Export in 1930 as assistant managing director of Goodyear-India and continued in that post until 1935 when he was appointed managing director.

P. W. Litchfield, president of Goodyear Aircraft Corp., long active in the dirigible field, filed a memorandum concerning lighter-than-air transport with the Civil Aeronautics Board at the start of its hearings on North Atlantic air routes October 16. Mr. Litchfield asked the board to take no action which would prejudice including commercial airships in international trade.

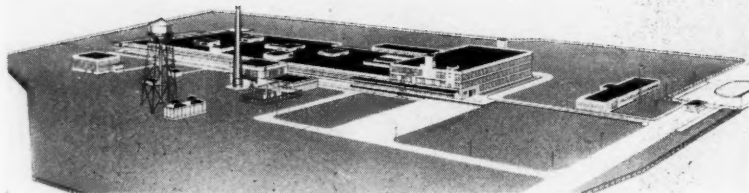
Harry L. Post, manager of Goodyear's shoe products division, recently disclosed that production of a new material, known as "Neolite," for shoe soles was under way in the Goodyear sole and heel plant at Windsor, Vt. The composition of the material has not been made public, but Mr. Post said it was not rubber, leather, plastic, or fabric. Weighing no more than leather soles, "Neolite" is said to be moistureproof and waterproof for the life of each sole and to insulate the wearers' feet against heat and cold.

The line of conveyor belts announced last spring by Goodyear will be known as "Coal-Flo" belts. The standard "Coal-Flo" belt, which consists of five plies of 28-ounce duck, is produced for use on standard, sectionalized conveyor equipment. An acid-neutralizing ingredient is compounded in the belt covers and carcasses which remains active indefinitely under mild acid conditions and lasts for years under so-called "bad" acid conditions in coal mines. A mildew inhibitor imparts also mildew resistance to the belts. A breaker strip is provided between cover and carcass to provide maximum cover-to-carcass adhesion as a protection against stripping hazards sometimes found in coal-mine uses of conveyor belts.

The Timken Roller Bearing Co., Canton 6, has appointed A. F. Sprankle metallurgical engineer in the steel and tube division. With Timken since 1934, he was formerly manager of the alloy bureau of Carnegie-Illinois Steel Corp.

The General Tire & Rubber Co., Akron, on November 13 dedicates its new tire plant at Waco, Tex., the first tire factory in the state, as part of "Texas-in-the-War" week, November 13-19.

A waterproofed nylon garment which can be used as a raincoat, shelter tent, or sleeping bag by a simple altering of snaps is being manufactured for the Armed Forces by General Tire & Rubber.



Architect's Drawing of Texas Tire Plant for General Tire & Rubber Co.

Avery New Goodrich Secretary

Willis F. Avery, assistant secretary of The B. F. Goodrich Co., Akron, since 1936, was elected secretary, succeeding Shelby M. Jett, who died August 9. The company's patent and legal departments will be under Mr. Avery's direction.

Born in Manchester, N. H., Mr. Avery attended local public schools, Brown University, the University of Maine, and the Washington, D. C., College of Law. He was principal of Limington Academy, Limington, Me., for several years before entering the United States Patent Office as assistant examiner in 1915. Mr. Avery was one of the organizers of the Patent Office Society and an officer from its founding until he left the government service after five years. Next Mr. Avery went on the legal staff of Westinghouse Electric & Mfg. Co. and four years later (in 1924) joined the Goodrich company.

Returning to the Far East for the first time since he was repatriated from a Japanese prison camp near Hong Kong in 1942, John F. Dwyer, of the Goodrich company, left Akron recently as a company technical representative on special assignment with the Army Air Corps. Mr. Dwyer, who since his return to the United States has been New York manager of the Goodrich international division, spent 10 years in the Orient before the war with the company's distributors in Manila, P. I., and as a representative of United Aircraft Corp., in China, where he was interned after the fall of Hong Kong. He was a "cellmate" of Paul Dietz, former Goodrich manager in China, in Standley prison camp for six months before they were exchanged on the first voyage of the *Gripsholm*.

One of the first experimental tires made of rubber from the *kok-saghyz* plant is shown, in the accompanying photograph,



Kok-saghyz in Tire Production

coming from the mold at the Goodrich plant in Akron. The tire will go into government service. In the lower photo Goodrich research staff members examine some bales of United States grown *kok-saghyz*, which is said to compare with prewar Far East plantation grades.

been retained by the company as a consultant.

Monsanto Chemical Co., St. Louis, Mo., has elected to the board Robert R. Cole, vice president of Monsanto and general manager of the phosphate division to succeed the late John C. Brooks. Mr. Cole came to Monsanto in 1935 when Monsanto acquired the Swann Chemical Corp., Anniston, Ala., of which he was general superintendent, and he was made assistant to the late R. J. Hawn, vice president. Then in 1938, Mr. Cole was named production manager of Monsanto's phosphate division and in 1939 general manager of all the division's activities. In May, 1941, he was appointed vice president of Monsanto as well as general manager of the phosphate division.

Promotion of Richard M. Hitchens to the position of associate research director of Monsanto's organic chemicals division was announced October 13. He was formerly assistant director and had started with the company in 1931 as a research chemist.

Hills-McCanna Co., 2364 Nelson St., Chicago 18, Ill., has appointed D. D. Foster Co. as its representative in the Pittsburgh, Pa., area with offices at 412 Peoples Gas Bldg., Pittsburgh 19, Pa. Don Foster and his associate, A. H. Stroyd, are widely known as equipment consultants in this area for a good many years, both having been previously associated with the Merco-Nordstrom Valve Co. and Pittsburgh Equitable Meter Co.

MIDWEST

Minnesota Mining & Mfg. Co., St. Paul, Minn., has acquired the Mid-States Gummed Paper Co., manufacturer of cloth tape and gummed paper and labels, 2515 S. Damen Ave., Chicago, Ill., at a reported cost of about \$1,000,000. The Chicago concern will be operated as a separate subsidiary of the St. Paul company.

National Standard Co., Niles, Mich., on October 2, through W. H. Parkin, president and general manager, announced that K. D. Smith had been appointed manager of its Worcester, Mass., Wire Works Division. Mr. Smith formerly was Washington representative of The B. F. Goodrich Co. and prior to that was assistant manager of its factory operations at Akron, O. Mr. Smith was most recently consultant on rubber products with the Ordnance Branch of the War Department, in both Washington and Detroit. He is a past president of The Tire & Rim Association, Inc., and also is active in the Society of Automotive Engineers and the American Chemical Society.

George W. Palmer, Mr. Smith's predecessor at the Worcester Wire Works, has



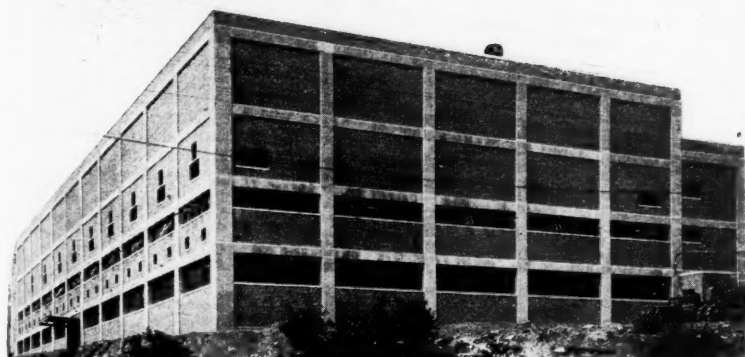
K. D. Smith

NEW ENGLAND

Armstrong's New Tire Facilities

Widely expanded manufacturing facilities at The Armstrong Rubber Co., West Haven, Conn., will soon help nearly double output of Armstrong tires. An extensive construction program is about completed, and machinery and equipment are being moved into the new factory building comprising about 100,000 additional square feet of floor space. This new addition was designed to incorporate the newest and most forward-looking methods known.

The new heater room where tires are to be cured is one of the outstanding features of the factory addition. From experience with heater room press installation it was determined that Armstrong's curing presses should be operated under the best possible conditions of room ventilation in order to minimize the production problems long attributed by the industry to heat-discomfort among the workers. This curing depart-



Extensive New Addition to The Armstrong Rubber Company Tire Plant in West Haven.

ment is on the top floor of the new factory in a room 260 feet long and 112 feet wide, with an average ceiling height of 25 feet. Eighteen 60-inch exhaust fans have been built into the ceiling to operate as power-driven roof ventilators—each fan is capable of exhausting approximately 27,000 cubic feet per minute, thereby effecting a complete change of air every minute-and-a-half. Augmenting this ceiling ventilation, 14 32-inch intake fans are provided in the side walls of the heater room to blow cooling air into the aisles between the curing presses. The column space and floors in the curing department have been especially designed to provide the most ideal location of the presses for increased efficiency of operation and to provide the best possible working conditions for employees.

The additional Banbury mixers needed to take the extra load of mixing synthetic compounds are located from mezzanine to ground floor and positioned to reduce the handling of materials to an absolute minimum. After final mixing, the compounded rubber will be fed directly to the extruding machines or to the calenders near the Banburys. Calenders are set up for tandem operation so that each side of the cord fabric will be impregnated with rubber as it passes through the calenders. Additional extruding machines provide for straight-line production of the two different types of stock which combine to make Armstrong tread and sidewalls—one compound for maximum tread mileage, and the other for elimination of heat build-up in sidewalls.

The second floor of the new factory addition is planned for tire building. Processed materials ready to be fabricated into tires will here come to the hands of the tire builders. Green tires coming from the builders and ready for bag-inserting will be handled on the third floor within the curing department. Cured and inspected, the tires are conveyed to the warehouse on the West Haven factory premises, ready for shipment.

The plan and construction of these expanded Armstrong manufacturing facilities came about as a result of Army requirements for increased heavy truck tire production throughout the industry. Prewar facilities were found overloaded and hampered by the differences occasioned by using synthetic rubber in tire making, instead of natural rubber.

Armstrong's participation in the sixty-million-dollar expansion program authorized by the government takes a great stride forward in providing the answer to the present-day wartime demand for tires and prepares The Armstrong Rubber Co. to meet the equally as great postwar tire needs of the nation.

Cambridge Rubber Co., Cambridge, Mass., has elected as treasurer and a director Arthur B. Newhall, formerly president of the Hood Rubber Co., Watertown, Mass., and United States Rubber Coordinator. Mr. Newhall, however, will continue to serve as a director and treasurer of the Dennison Mfg. Co.

CANADA

Synthetic Rubber Plant Anniversary Celebrated

The first anniversary of the production of synthetic rubber at the plant of Polymer Corp., Sarnia, Ont., was marked September 29 with appropriate ceremonies attended by 350 visitors including Canadian and United government officials and executives of rubber and other companies. Production during the past year totaled about 27,000 tons. The present rate of output is 35,400 tons a year of Buna S, and 4,100 tons of Butyl rubber. The plant is capable of producing at a rate 11% greater than its original rated annual capacity of 38,000 tons.

The ceremony, also attended by 1,500 of the plant's 1,800 workers, was held at the Buna S unit, with C. D. Howe, Minister of Munitions and Supply, as the main speaker. Mr. Howe stated that commercial chemicals and plastics would likely be made at the plant as well as elastomers after the war. Stanley T. Crossland, vice president of Rubber Reserve Co., Washington, D. C., said that operating experience in United States and Canadian synthetic plants has shown an actual annual capacity of 1,100,000 tons. This amount is almost double the highest peacetime requirements, he pointed out, but declared that a large percentage of the plants would be operated in the postwar period. R. C. Berkinshaw, president of Polymer Corp., said that Polymer's production costs compare favorably with the lowest in the synthetic rubber industry and reported that the sales values of the 27,000 tons of rubber produced at the plant was \$24,000,000. Major Simon Duclos, chief driving and maintenance instructor at the Canadian Army Driving and Maintenance School, Woodstock, Ont., told Polymer workers

that tires made from the Polymer plant synthetic rubber had given good service under combat conditions. It was announced that the price of Canadian-made synthetic rubber has been reduced from 35¢ to 30¢ a pound. The original price for the Sarnia plant's product was 40.5¢.

Prior to the afternoon ceremony the visitors were taken on a tour of the plant, which also recently began the production of cumene, a blending agent for aviation gasoline.

Mr. Howe, in a nationwide broadcast October 27 from Ottawa, said that the Canadian Government plans to continue operating the synthetic rubber plant at Sarnia. He further stated that where it is considered desirable in the best interests of the nation to continue such properties as Polymer Corp., under government ownership and operation, they will continue to be so maintained and operated.

The Canadian Agriculture Department, Ottawa, Ont., announced October 3 that experimental work is being conducted on *lactuca diennis*, a plant native to British Columbia, as a possible source of rubber, but the Department has not yet determined whether the plant has commercial possibilities. The announcement came after Nicholas Boldt, a Netherlands research chemist who came to Canada in 1924 and who had worked formerly on rubber plantations in Netherlands India, reported his experiments with the plant indicated a potential annual yield of 600 pounds of rubber per acre. Mr. Boldt claimed the plant, which grows 18 feet high in 1½ years, would put rubber on the market in Vancouver at a cost of 25¢ a pound. Tests of the latex extracted from the plant have been conducted in Vancouver and Seattle chemical laboratories over the past five years. This work was kept secret until recently when colored motion pictures showing extraction of latex from the plant were shown Vancouver rubber company officials. Several unnamed Vancouver business men have assisted Mr. Boldt in financing his research.

Experiments in growing rubber locally have been set up in practically all experimental farms in Canada. J. G. Gardiner, Canadian Minister of Agriculture, revealed recently in the House of Commons. On the Central Experimental Farm at Ottawa there are 10 acres of rubber plants, and in Peterborough County in Ontario, 600 acres. Various rubber producing plants are being tested, including dandelions, of which there are six acres in Ottawa.

D. W. Ambridge, vice president, Ontario Paper Co., St. Catharines, Ont., will continue as vice president of Polymer Corp., Sarnia, Ont., although he has resigned as director-general of the Shipbuilding Branch, Department of Munitions & Supply, Ottawa, Ont. Mr. Ambridge, who had been on loan to the government, is returning to private business.

Rubberset Co., Ltd., with a plant at Gravenhurst and sales office in Toronto, both in Ont., announced on October 23 the appointment of L. S. Hewes as president and general manager and of Bruce Findlay as vice president in charge of production. The company also named a new board of directors, including Henry P. Bristol, president, Bristol-Myers Co., New York, N. Y., and G. L. Herrick, president, and Donald Dean, treasurer, Rubberset Co., Newark, N. J.

OBITUARY

Charles K. Williams

CHARLES KOFFMAN WILLIAMS, founder of C. K. Williams & Co., and its board chairman and treasurer, died October 12 at his home in Easton, Pa., following an illness of several months. Mr. Williams was born on January 31, 1862, in Jarrettsville, Pa., and educated in Jarrettsville schools and at Knight's Sunnyside Academy, Ambler, Pa.

After serving as an apprentice machinist at Doylestown, Pa., for four years he joined his father in the production of talc and soapstone at Easton. In the early 1880's he engaged in the production of pigment colors from natural crudes found near Easton and in neighboring states. As business developed, foreign crudes were imported, and in the early 1900's equipment was installed for the production of synthetic pigments. In 1912 ore mines and manufacturing plants were acquired in Spain and subsequently other plants were bought or built in several United States cities. Mr. Williams also established the Paper Makers Chemicals Corp., which was sold in 1931 to the Hercules Powder Co. Besides he was a director of the Penna. Mfrs. Association Casualty Insurance Co.

Mr. Williams served on the Easton Y. M. C. A. board for nearly 60 years and was a past-president. He was also a member of the board of Easton Hospital and a trustee of the Community Welfare Chest of Easton and of First Presbyterian Church of Easton for about 50 years. He was a Mason, a Knights Templar, a Shriner, and a member of Rotary, Pomfret, and Northampton County Country clubs. He was also active in the Pennsylvania Manufacturers Association. During the first World War the deceased was United States Food Administrator for Northampton County.

Survivors include a son, a daughter, a sister, and two grandchildren.

Fin Sparre

A HEART attack resulted in the death, on October 7, at his home in Wilmington, Del., of Fin Sparre, a director of E. I. du Pont de Nemours & Co., Inc., Wilmington, and for 25 years director of its development department until he retired August 31.

A native of Bergen, Norway, where he was born August 31, 1879, Dr. Sparre specialized in chemistry and engineering in his education at the Technical College, Kristiania, Norway, and later at the University of Dresden, Germany.

After a short period with the Powder & Ammunition Works of the Norwegian Government, he came to this country in October, 1903, and joined du Pont as a chemist at its experimental station. He became its chief chemist in 1910 and two years later its director. Then on April 1, 1918, Dr. Sparre was named assistant director of the development department and in May, 1919, director. Dr. Sparre was elected to the du Pont directorate in 1930 and was made a director of the Remington Arms Co., Bridgeport, Conn., in 1933. He also served on many important government committees dealing with scientific advancement.

The deceased is survived by his wife, three sons, and two daughters.

Funeral services were held October 11 at the Sparre residence.

Russell Y. Cooke

AFTER a long illness Russell Y. Cooke died September 8 at his home in Charlotte, N. C. Mr. Cooke was born in Cuyahoga Falls, O., May 17, 1884, and was educated in the public schools there.

His early associations in industry included The B. F. Goodrich Co. and Morgan & Wright, for which firm he was assistant sales manager of the automobile tire department. He successively became manager of the central district service department of the United States Tire Co., sales manager, secretary and director of the Racine Rubber Co., and a director of the Ajax Rubber Co. Later Mr. Cooke was made central district manager of the McClaren Rubber Co. and in 1931 assistant general sales manager. From 1935 until 1938 he was associated with the United States Rubber Co. in a sales capacity and in the latter year became tire marketer for the American Oil Co. In 1943 Mr. Cooke obtained a leave of absence from that company to serve as a senior investigator for OPA.

He was a member of the Elks, the Masons, and the Sons of the American Revolution.

Funeral services were held September 11 at Charlotte and burial was in Sharon Memorial Park there.

Survivors include the wife, a son, a daughter, a sister, and four brothers.

George F. Chapman

GEORGE F. CHAPMAN, an official of the Boston Woven Hose & Rubber Co., Cambridge, Mass., prior to his retirement, died September 3 at his home in Plymouth, Mass. He was born in Canton, Mass., September 14, 1860, and educated in Canton schools, Chauncey Hall, and the Massachusetts Institute of Technology. After a period of residence in Evanston, Wyo., he returned to Massachusetts in 1912 and in 1918 became superintendent of a reclaiming plant at Plymouth. From 1929 to his retirement in 1938, Mr. Chapman was engaged in engineering work at the Cambridge plant of Boston Woven Hose.

Funeral services were held September 6 at the First Congregational Parish (Unitarian) Church of Canton, and burial was in Canton Corner Cemetery.

Two daughters and a son survive.

P. E. Herman

FUNERAL services were held in Cincinnati, O., September 26 for P. E. Herman, 75, retired salesman of Monsanto Chemical Co.'s organic division, who died September 23 at his home in Cincinnati, following a long illness. A graduate pharmacist, with a long drug and chemical background, Mr. Herman entered Monsanto's service in 1925 and for 11 years covered a southern and midwestern sales territory. He went on a part-time schedule in 1936, limiting his sales territory to the Cincinnati area.

Surviving are two sons.

Fixed Government Prices*

	Price per Pound	
	Civilian Use	Other Than Civilian Use
Balata		
Manaos Block.....	\$0.38½	\$0.38½
Swinam Sheet.....	.42½	.42½
Guayule		
Guayule (carload lots).....	.17½	.31
Latex		
Normal (tank car lots).....	.26	.43½
Creamed (tank car lots).....	.26½	.44½
Centrifuged (tank car lots).....	.27½	.45½
Heat-Concentrated (carload drums).....	.29½	.47
Plantation Grades		
No. 1X Ribbed Smoked Sheets....	.22½	.40
1X Thin Pale Latex Crepe.....	.22½	.40
2 Thick Pale Latex Crepe.....	.22	.39½
1X Brown Crepe.....	.21½	.38½
2X Brown Crepe.....	.21½	.38½
2 Remilled Blankets (Amber).....	.21½	.38½
3 Remilled Blankets (Amber).....	.21½	.38½
Rolled Brown.....	.18	.35½
Synthetic Rubber		
GR-M (Neoprene GN).....	.27½	.45
GR-S (Buna S).....	.18½	.36
GR-I (Butyl).....	.16½	.33
Wild Rubber		
Upriver Coarse (crude).....	.12½	.26½
(washed and dried).....	.20½	.37½
Islands Fine (crude).....	.14½	.28½
(washed and dried).....	.22½	.40
Caucho Ball (crude).....	.11½	.24½
(washed and dried).....	.19½	.37
Mangabiera (crude).....	.08½	.19½
(washed and dried).....	.18	.35½

*For a complete list of all grades of all rubbers, including crude, balata, guayule, synthetic, and latex, see Rubber Reserve Co. Circular 17, p. 169, May, 1943, issue.

Dividends Declared

COMPANY	STOCK	RATE	PAYABLE	STOCK OF RECORD
American Hard Rubber Co.....	Pfd.	\$1.75 q.	Sept. 30	Sept. 15
American Hard Rubber Co.....	Com.	0.25	Sept. 30	Sept. 15
Boston Woven Hose & Rubber Co.....	Com.	0.50 q.	Nov. 25	Nov. 15
Boston Woven Hose & Rubber Co.....	Com.	0.50 spec.	Nov. 25	Nov. 15
Crown Cork & Seal Co.....	Com.	0.25	Oct. 17	Sept. 22
Crown Cork & Seal, Ltd.....	Com.	0.50 q.	Nov. 15	Oct. 14
Dayton Rubber Mfg. Co.....	Pfd. A.	0.50 q.	Oct. 25	Oct. 10
Dayton Rubber Mfg. Co.....	Com.	0.25	Oct. 25	Oct. 10
Endicott Johnson Corp.....	Pfd.	1.00 q.	Oct. 2	Sept. 20
Faultless Rubber Co.....	Com.	0.25 irreg.	Oct. 1	Sept. 15
Firestone Tire & Rubber Co.....	Pfd.	1.125 q.	Dec. 1	Nov. 15
Firestone Tire & Rubber Co.....	Pfd.	1.125 q.	Dec. 15	Nov. 15
General Cable Corp.....	Pfd.	1.75 accum.	Nov. 1	Oct. 20
General Electric Co.....	Com.	0.35 q.	Oct. 25	Sept. 22
General Tire & Rubber Co.....	Pfd.	1.125 q.	Sept. 30	Sept. 20
General Tire & Rubber Co.....	Com.	1.125 q.	Sept. 30	Sept. 20
Goodyear Tire & Rubber Co., Inc.....	Pfd.	1.25 q.	Dec. 15	Nov. 15
Goodyear Tire & Rubber Co., Inc.....	Com.	0.50	Dec. 15	Nov. 15
Goodyear Tire & Rubber Co. of Canada, Ltd.....	Pfd.	0.625 q.	Oct. 2	Sept. 14
Goodyear Tire & Rubber Co. of Canada, Ltd.....	Com.	0.62 q.	Oct. 2	Sept. 14
Hercules Powder Co.....	Com.	1.50 q.	Nov. 15	Nov. 3
I. B. Kleiner Rubber Co.....	Com.	0.30 irreg.	Sept. 12	Sept. 1
Lee Rubber & Tire Corp.....	Com.	0.50 q.	Oct. 31	Oct. 16
Lima Cord Sole & Heel Co.....	Com.	0.10	Sept. 30	Sept. 20
Mansfield Tire & Rubber Co.....	Pfd.	0.30 q.	Oct. 2	Sept. 15
Mansfield Tire & Rubber Co.....	Com.	0.25 q.	Sept. 20	Sept. 9
Midwest Rubber Reclaiming Co.....	Com.	0.50 q.	Oct. 31	Oct. 20
Norwalk Tire & Rubber Co.....	Pfd.	0.875 q.	Jan. 2	Dec. 15
Okonite Co.....	Com.	1.50 q.	Nov. 1	Oct. 18
Rome Cable Corp.....	Com.	0.15 q.	Sept. 29	Sept. 13

Patents and Trade Marks

APPLICATION

United States

2,357,335. Flexible Abrasive Sheet Material Including an Impregnating Coat of a Non-Oxidizable Thermoplastic Resin of the Group of Polyvinyl Acetals, Substituted Butadiene Polymers of Thermoplastic Character, and Thermoplastic Adhesive Cellulose Derivatives. J. H. Kugler and B. J. Oakes, assignors to Minnesota Mining & Mfg. Co., all of St. Paul, Minn.

2,357,348. Abrasive Article in Which the Bonding Material Is a Polymerized Mono-Hydric Alcohol Ester of Alkyl Substituted Acrylic Acid. G. P. Netherly and B. S. Cross, both of St. Paul, Minn., and G. R. Anderson, Wilmington, Del., assignors to Minnesota Mining & Mfg. Co., St. Paul, Minn.

2,357,350. Thermoplastic Synthetic Resin in a Flexible Abrasive Article. B. J. Oakes, assignor to Minnesota Mining & Mfg. Co., both of St. Paul, Minn.

2,357,409. In a Molded Composition for Brake Linings, the Use of a Heat Hardenable Phenol-Aldehyde Synthetic Resin and a Reaction Product of Shellac Acids as Bonding Agent. J. N. Kuzmick, Clifton, assignor to Raybestos-Manhattan, Inc., Passaic, both in N. J.

2,357,446. Cleaning Device Including a Flexible and Compressible Shaping Member and a Hollow Sponge Rubber Member. A. Z. Bendar, Round Lake, Ill., assignor by mesne assignments to L. C. Rogers, Niles, Mich.

2,357,461. Shampoo Cape with Ridges to Conduct Liquid Downward. F. H. Ellinger, Chicago, Ill.

2,357,491. Grip for Sport Clubs. T. S. Park, Houston, Tex.

2,357,506. Elastic Knitted Stocking Top. R. E. Davis, assignor to W. B. Davis & Son, Inc., both of Fort Payne, Ala.

2,357,513. Rubber Sealing Strip. U. L. Harmon, Oak Park, assignor to Dryden Rubber Co., Chicago, both in Ill.

2,357,597. Rubber Ring in a Bearing Mounting for a Cylindrically Bored Housing. E. F. Martinec, Cleveland, O., assignor to Norma-Hoffman Bearings Corp., Stamford, Conn.

2,357,651. In a Conveyor Propelling Device, the Use of Pneumatic Tires. H. W. Hapman, Detroit, Mich.

2,357,662. Protective Sheet Material for Smooth Polished Metallic Surfaces, Consisting of a Thin Flexible Sheet Backing Coated with Rubber and a Butadiene-Acrylic Acid Nitrile Mixed Polymerizate as Protective Agent for the Rubber. M. H. Kemp, Oak Park, Ill., assignor to Kendall Co., Boston, Mass.

2,357,692. Thermometer Support of Elastic Material. T. F. Saffady, Detroit, Mich.

2,357,740. Vibration Insulating Mounting for Instruments, Including a Rubber Element Deformable in Shear by Central Load of the Element at Right Angles to Its General Plane. N. E. Hickin, Castle Bromwich, and W. H. Hogg and M. A. Castle, Sutton Coldfield, assignors to Dunlop Rubber Co., Ltd., London, all in England.

2,357,842. Container of Thermoplastic Film. G. A. Moore, New York, N. Y., assignor to Shellmar Products Co., Mount Vernon, O.

2,357,893. Ankle Joint for Artificial Limbs. N. F. Harrington, Los Angeles, Calif.

2,357,929. Fire Extinguishing Pump. H. E. Brandt, North St. Paul, Minn.

2,357,979. Atomizer for Applying a Single Dose of Medicine. J. B. Schmitt and W. R. Dodds, assignors to De Vilbiss Co., all of Toledo, O.

2,358,019. Flexible Hose Coupling Component Suitable for Use with Medium or High Pressure Hose. W. A. Melsom, assignor to Bowden (Engineers), Ltd., both of London, England.

2,358,066. Ice Creeper for Shoe Heels Consisting of a Spur Plate and Elastic Band and Strip to Hold It in Place. C. Harvey, Canastota, N. Y.

2,358,081. In the Canopy of a Brooder, Heating Units Including a Sheet Material, an Electrically Conducting Layer of Rubber Carried by This Material, and Conductor Wires Secured to Portions of the Conductor Sheet. L. Marick, Grosse Pointe Farms, Mich., assignor to United States Rubber Co., New York, N. Y.

2,358,151. Mask Structure Having a Compressible Hollow Body of Resilient Material. J. E. Duggan, New Brighton, Pa.

2,358,189. Sheet Engraving Gum of Layers of Hard and Soft Natural or Synthetic Rubber. E. A. Sprigg, Wadsworth, and E. O. Macy, Cuyahoga Falls, O., assignors to B. F. Goodrich Co., New York, N. Y.

2,358,440. Protective Sheath with Thin, Flexible, Expandable Resilient Walls for Medical and Surgical Use. E. F. Bowman, Boston, assignor to E. T. Wyman, Brookline, both in Mass.

2,358,484. Lip Shield of Thin Plastic Material. K. Torjussen, Brooklyn, N. Y., and J. Ingram, Oakland, Calif.

2,358,606. Segmental Washer. R. B. Summers, Stockton, Calif.

2,358,936. For a Pipette, a Compressible Suction Bulb Having within It a Flexible Tubular Member. W. T. Mathis, Hamden, Conn., assignor to Clay Adams Co., Inc., New York, N. Y.

2,358,950. In a Poppet Valve, a Poppet Element of an Organic Plastic Product Free from Appreciable Cold Flow. W. C. Trautman, North Hollywood, Calif., assignor by mesne assignments to Bendix Aviation Corp., South Bend, Ind.

2,358,991. Variable Electric Resistance Having Elements of Synthetic Plastic Material. L. W. Miller, assignor to Morgan Crucible Co., Ltd., both of London, England.

2,359,000. A Vibration Isolator and Shock Absorbing Device for Isolating Machinery Bases from a Foundation, Including a Resilient Non-Metallic Vibration Absorbing Cushioning Lining. S. Rosenzweig, New York, N. Y.

2,359,003. Spring Cushion Consisting of a Sponge Rubber Cushion Body Having Cavities in Which Are Inserted Removable Coil Springs. F. A. Sawyer, South Bend, assignor to Mishawaka Rubber & Woolen Mfg. Co., Mishawaka, both in Ind.

2,359,163. Interlayer of Organic Plastic Material in a Glazing Unit. J. H. Sherts, Pittsburgh, assignor to Pittsburgh Plate Glass Co., Allegheny County, both in Pa.

2,359,250. Laminated Wrapping Material Consisting of Outer Layers of Aluminum Foil, an Inner Adhesive Layer of Asphalt-Reclaimed Rubber, and a Relatively Thin Paper Layer between the Adhesive Layer and One of the Outer Metal Layers. O. K. Schmidt, Upper Montclair, N. J., assignor to Reynolds Research Corp., New York.

Dominion of Canada

422,296. Pack Envelope with Bottom of Elastic Fabric in a Parachute Pack. F. G. Manson, Dayton, and J. J. Maskey, East Dayton, both in O., U. S. A.

422,302 and 422,303. Flexible Coupling Assembly. T. L. Fawick, Akron, O., U. S. A.

422,322. Drawn Hood-Type Pliable Metal Closure for Glass Bottles, Etc., Provided with a Flexible Sealing Coating Consisting of a Wax-Miscible, Unoxidized Condensation Derivative of Rubber. Aluminum Co. of America, Pittsburgh, assignee of A. G. Osborne, New Kensington, and T. M. Hill, Arnold, both in Pa., U. S. A.

422,357. Non-Skid Rubber Tread in Which Non-Yielding Plates Are so Arranged as to Provide a Series of Slits, One Edge of Which Is Hard and the Other Yielding and Deformable under Load. Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont., assignee of F. G. W. King, Birmingham, Warwick, England.

422,358. Tire Tread Having Circumferential Load Supporting Ribs, Portions of Which Ribs Are Rendered Softer Than the Remainder by Clusters of Holes. Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont., assignee of F. G. W. King, L. J. Lamborn, and F. J. McNally, all of Birmingham, Warwick, England.

422,359. Independent Vehicle Wheel Suspension. Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont., assignee of H. M. and R. D. Sadler, both of Castle Bromwich, Warwick, England, administrator of the estate of Seth Sadler, deceased, in his lifetime of Birmingham.

422,492. Applying Permanent Identification Marks to Fabrics, the Use of a Thin Sheet of Rubber from Which Marks Are Stamped and Vulcanized on to the Fabric. National Marking Machine Co., Cincinnati, assignee of J. Miglarese, North College Hill, both in O., U. S. A.

422,539. Grooved, Rubber-Covered Roller for Textile Treating Apparatus. A. Mellor and R. J. Mann, both of Spondon, England.

422,570. For Application to Articles with an Elongated Opening, an Overlay Having a Body Portion of Firm Extruded Plastic. C. E. Slaughter, New Canaan, Conn., U. S. A.

422,634. Tape Impregnated with a Mixture of Polystyrene, Rubber, Polyisobutylene, Polyethylene, and Monostyrene. International Standard Electric Corp., New York, N. Y., U. S. A., assignee of A. A. New, S. G. Foord, and D. R. Beckwith, all of London, England.

422,677. Windshield Cleaner. Trico Products Corp., Buffalo, assignee of D. N. Mussen, Williamsport, both in N. Y., U. S. A.

422,756. Abrasive Composition Having as Bonding Agent the Reaction Product of a Diolefin Adduct of a Conjugated Unsaturated Dibasic Acid and a Member of the Group of Polyhydric Alcohols and Polyalkyl Amines. Carbide & Carbon Chemicals, Ltd., assignee of Bakelite Corp. of Canada, Ltd., both of Toronto, Ont., assignee of R. S. Daniels, Union, and A. J. Mostello, Newark, both in N. J., U. S. A.

422,847. Tread Unit for Endless Tracks. F. E. Burgess, Geneva, Ill., U. S. A.

422,910. In a Reducing Valve, a Dome with an Opening, a Diaphragm Adjacent to It, and a Gas-Filled Balloon within the Dome. Kieley & Mueller, Inc., North Bergen, assignee of F. A. Quiroz, Newark, both in N. J., U. S. A.

422,916. Amine Formaldehyde Resin in Grinding Wheels. Norton Co., Worcester, assignee of L. Coes, Jr., Brookfield, both in Mass., U. S. A.

422,917. Amine Formaldehyde Resin in Grinding Wheels, Etc. Norton Co., Worcester, assignee of L. Coes, Jr., Brookfield, both in Mass., U. S. A.

422,935. In a Radio Shielded Conduit, a Flexible Tube of Rubber-Like Material. Titeflex Inc., Newark, formerly Titeflex Metal Hose Co., assignee of E. E. Stone, Middlesex, both in N. J., and E. Stone, Rochester, N. Y., executors of the estate of R. H. Stone, deceased, in his lifetime of Middlesex, N. J., both in the U. S. A.

422,946. Rubber Flooring. Wingfoot Corp., assignee of W. E. Campaigne, both of Akron, O., U. S. A.

422,950. Handle Structure for a Plug Gage, Including a Hollow Main Body Portion of Plastic Material. N. A. Woodworth Co., Ferndale, assignee of G. Hahwart, Orchard Lake, both in Mich., U. S. A.

United Kingdom

562,521. Acid Resistant Rolls. Wingfoot Corp.

562,557. Insulating Coating of Thermoplastic Material for Electrical Conductors. E. G. Williams and Imperial Chemical Industries, Ltd.

562,646. Cable Impregnating and Filling Media. Middlesex Oil & Chemical Works, Ltd., and J. W. Thom.

562,679. Abrasive Bodies Bonded with Synthetic Resins. Norton Grinding Wheel Co., Ltd.

562,766. Electrical Insulating Material. Middlesex Oil & Chemical Works Ltd., and J. W. Thom.

562,801. Rubber Sealing Rings. AC-Sphinx Sparking Plug Co., Ltd., and D. B. Browne.

563,123 and 563,124. Abrasive Bodies Bonded by Synthetic Resins. Norton Grinding Wheel Co.

563,140. Resilient Torque-Transmitting Couplings. English Electric Co., Ltd., and E. A. Binney.

563,196. Adhesive Reinforcement Patches for Garments. F. M. Prestwich.

563,251. High Frequency Cables. C. G. Lemon and Tenaplas, Ltd.

563,354. Sealing Gaskets for Container Closures. Sylvania Industrial Corp.

563,390. Mechanical Milking Apparatus. Alfa-Laval Co., Ltd., and N. Corderoy.

563,423. Resilient Mountings for Parts of Mechanically Propelled or Other Vehicles. C. Macleth and V. G. Loyd.

563,550. Windscreen Wiper. H. N. Wylie.

563,599. Hot Water Bottles. L. Mansbach.

563,619. Molded Articles. Westinghouse Electric International Co.

563,628. Endless Track Tread. F. E. Burgess.

PROCESS

United States

2,357,260. Molding Rubber Footwear. E. Rollmann, Brussels, Belgium, assignor to H. Rollmann, Gue Gardens, N. Y.

2,357,536. Depositing a Film of Non-Metallic Material from a Liquid Dispersion thereof on Both Surfaces of a Flexible Support of Sheet Material. J. F. Morse, Hudson, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,357,686. Continuous Impregnating of Cables, Etc. F. Peel, Gidea Park, and R. S. Vincent, London, assignors to Callender's Cable & Construction Co., Ltd., London, both in England.

2,357,837. Applying a Thermoplastic Adhesively Coated Thin Cellulosic Overcap to the Top End of a Sealed Wax-Coated Fiber Container. D. G. Magill, Great Neck, assignor to American Can Co., New York, both in N. Y.

2,358,126. Inner Tubes. C. J. Barkley, assignor to Wingfoot Corp., both of Akron, O.

2,358,176. Forming Articles of Plastic, but Distortion-Resisting Rubber-Like Material. F. J. MacDonald, Brookline, Mass., assignor to B. F. Goodrich Co., New York, N. Y.

2,358,204. Pile Fabrics. W. F. Bird, Swarthmore, assignor to Collins & Aikman Corp., Philadelphia, both in Pa.

2,359,227. Simultaneous Flocking of a Plurality of Adhesively Coated Base Fabrics. G. S. Hiers, Cala-Cynwrd, assignor to Collins & Aikman Corp., Philadelphia, both in Pa.

2,358,259. Articles from Heat Molded Thermoplastic Material. K. G. Siedschlag, Kent, and C. F. Hilldring, Akron, both in O., assignors to American Hard Rubber Co., New York, N. Y.

2,358,368. Making Pile Fabric in a Continuous Cyclic Series of Operations. V. A. Victor, Brooklyn, N. Y.

2,358,535. Baseball Cores. G. M. Raymond and G. H. Swart, both of Wabash, Ind., assignors to General Tire & Rubber Co., Akron, O.

2,358,962. Reinforced Compressible Cushion of Spongy Rubber-Like Material. M. M. Cunningham,

ham, South Bend, assignor to Mishawaka Rubber & Woolen Mfg. Co., Mishawaka, both in Ind.
2,359,013. Injection Molding of Granular Plastic Materials. W. R. Tucker, Dayton, O., assignor to Hydraulic Development Corp., Inc., Wilmington, Del.

Dominion of Canada

422,355. Vulcanizing Rubber by Applying External Heat to Electrically Conductive Unvulcanized Rubber and Passing an Electric Current Through It. Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont., assignee of E. F. Powell, D. Bulgin, and P. W. Badham, all of Birmingham, Warwick, England.
422,457. Molding a Crystalline Synthetic Linear Polyamide. Canadian Industries Ltd., Montreal, P. Q., assignee of W. E. Gordon, Wilmington, Del., U. S. A.
422,494. Providing a Solid Termination in an Impregnated Cable. Northern Electric Co., Ltd., Montreal, P. Q., assignee of J. K. Webb, London, England.
422,497. Article from a Sheet of Organic Plastic Material. Plax Corp., assignee of Hartford-Empire Co., both of Hartford, Conn., assignee of C. B. Strauch, Milwaukee, Wis., U.S.A.
422,633. Electrically Insulating Body. International Standard Electric Corp., New York, N. Y., U. S. A., assignee of E. C. Lee, London, England.
422,945. Heat-Sealing at Least Two Plies of Heat-Sealable Thermoplastic Film. Wingfoot Corp., Wilmington, Del., assignee of J. F. Vincent, Akron, O., both in the U. S. A.

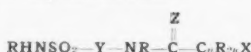
United Kingdom

563,032. Electric Insulators. Standard Telephones & Cables, Ltd., and J. K. Webb.
563,065. Footwear. Dunlop Rubber Co., Ltd., L. Phillips, F. Bridgman, and H. J. Walters.
562,875. Shaping Tire Casings. A. H. Stevens, (Firestone Tire & Rubber Co.).
562,957. Manufacture of Rubber. Pirelli-General Cable Works, Ltd., C. W. Buckles, and A. McAulay.
563,121. Shaping Plastics by Extrusion. E. P. Newton (Plax Corp.).
563,126. Thermoplastic Articles. J. C. Nicholson and Runnicote, Ltd.
563,213. Sheet Material. Revertex, Ltd., and F. S. Roberts.
563,586. Coated Fabrics. Lustrafil, Ltd., and G. L. Godman.
563,589. Articles of Plastic Materials. D. Finlayson and H. Crawshaw.
563,723. Flexible Sheet Materials. S. C. Frowde and Imperial Chemical Industries, Ltd.
562,389. Curing Bags and Associated Apparatus for Tire Manufacture. Henley's Tire & Rubber Co., Ltd., and E. C. Woods.
562,712. Tire Shaping Apparatus. A. H. Stevens, (Firestone Tire & Rubber Co.).
562,830. Machine to Cover Wires with Insulating Materials. British Insulated Cables, Ltd., G. H. Walton, J. C. Quayle, and P. Jones.
563,565. Vulcanizer. Kautex (Plastics), Ltd., and E. E. Parker.
563,742. Rotary Cutter for Grooving, Slotting, Turning, and Milling Plastic Material. J. Boscovitch.
563,743. Apparatus for Producing Shaped Articles from Plastic Sheet Material. J. Boscovitch.

CHEMICAL

United States

2,357,383. Glycerol Borate Modified Chlorinated Rubber. J. M. Coe, Verona, N. J., assignor to Carbide & Carbon Chemicals Corp., New York, N. Y.
2,357,526. Giving Textiles a Finish Similar to Starch Finish by Applying an Emulsion of a Modified Phthalic Anhydride-Polyhydric Alcohol Resin in an Alkaline Casein Solution. D. W. Light and A. D. Nute, both of Stamford, Conn., assignors to American Cyanamid Co., New York, N. Y.
2,357,635. Composition Consisting of an Acid-Curing Thermosetting Resin Carrying as Curing Agent a Compound of the Class of (1) Compounds of the General Formula



Where n is an Integer at Least 1 and not More Than 2, Z is of the Class of Oxygen and Sulphur, Y a Divalent Carbocyclic Radical, R of the Class of Hydrogen and Monovalent Hydrocarbon and Halohydrocarbon Radicals, and X is a Halogen Atom; and (2) Soluble, Fusible Aldehyde-Reaction Products of the Compound of (1). G. F. D'Alleio, Pittsfield, Mass., assignor to General Electric Co., a corporation of N. Y.
2,357,650. Free - Flowing Puncture - Sealing Composition Consisting of a Cold Swelling Sub-

Water, a Polyhydric Alcohol, a Small Amount of Fibrous Material, and a Small Proportion of Granulated Rubber. L. A. Hall, Chicago, Ill., assignor to B. R. Conolly, Rockville Centre, N. Y.
2,357,676. Aqueous Natural Rubber Dispersion Containing as Plasticizer and Thickener a Liquid Hydrocarbon Oil Obtained by Polymerizing a Mixture of Normal Butenes and Isobutene. G. P. Mack, Jackson Heights, assignor to Advance Solvents & Chemical Corp., New York, both in N. Y.
2,357,798. Water-Soluble Resinous Composition Obtained by Condensing (a) a Phenol from the Group of Phenol and Metacresol, (b) Formaldehyde, and (c) a Water-Soluble Inorganic Sulphite. W. S. Niederhauser, Moorestown, N. J., and M. W. Miller, assignors to Resinous Products & Chemical Co., both of Philadelphia, Pa.

2,357,833. Thermoplastic Composition Including a Thermoplastic Polymer and, as a Lubricant Thereof, a Small Proportion of a Lower Alkyl Ester of a Saturated Hydroxy Fatty Acid. E. L. Kropschott and M. J. Hunter, assignors to Dow Chemical Co., all of Midland, Mich.
2,357,839. Plastic Composition Including a Principal Amount of a Polyamide and a Plasticizing Amount of a "Polymeric Fat Acid." R. H. Manley and C. D. Evans, both of Peoria, Ill., assignors to C. R. Wickard, as Secretary of Agriculture of the United States of America, and his successors in office.
2,357,855. In a Process for Producing 1,3 Butadiene, the Step of Passing Ethanol over a Catalyst Including Magnesium Oxide and Silica at an Elevated Temperature. W. Szukiewicz, New York, N. Y., assignor by mesne assignments of 24% to himself, 55% to T. Kuzniarz, as delegate of the Ministry of Finance of the Republic of Poland, 20% to Dal, Inc., New York, N. Y., and 1% to B. Przedselski.

2,357,857. Carbon Black. T. A. Te Grotenhuis, Olmsted Falls, O.
2,357,861. Increasing the Particle Size and Stability of a Synthetic Rubber Latex Prepared by Polymerizing Butadiene-1,3 in an Aqueous Emulsion, by the Addition of an Amount of a Water-Soluble Weak Acid Insufficient to Coagulate the Latex, and Reacting This Acid in the Latex with Sufficient Ammonia to Form an Ammonium Salt, but Insufficient to Coagulate the Latex. E. A. Willson, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,357,910. Separation and Concentration of Cis- and Trans-forms of Conjugated Diolefins. R. F. Robey, Roselle, and H. K. Wiese, both in Union, N. J., assignors by mesne assignments to Jasco, Inc., a corporation of N. Y.
2,357,917. Emulsion of a Resinous Gum in an Aqueous Medium Containing Solubilized Casein as Emulsifier. A. N. Stull, Newark, and W. L. Abramowitz, Lakewood, assignors to National Oil Products Co., Harrison, all in N. J.
2,358,130. Moist Ester of the Class of Monochloro- and Monobromomaleates and Fumarates Containing not More Than 1% of water. C. R. Milone, assignor to Wingfoot Corp., both of Akron, O.

2,358,167. Titanium Oxide Pigment. J. L. Keats and J. E. Booge, assignors to E. I. du Pont de Nemours & Co., Inc., all of Wilmington, Del.
2,358,195. Manufacturing Tear-Resistant Rubber Crepe or Sheet from a Mix Consisting of Raw Rubber Compounded with Vulcanizing Ingredients and a Larger Proportion of Unmasticated Raw Rubber. B. Wilkinson, G. D. Ingram, and H. Waumsley, B. Wilkinson, assignor to Wilkinson Rubber Linatex, Ltd., and Ingram and Waumsley, assignors to J. G. Ingram & Son, Ltd., all of London, England.

2,358,290. Material for Forming Abrasion and Oil-Resistant Gaskets, Etc., Consisting of Natural or Synthetic Rubber, Carbon Black, and Graphite Flakes Premixed with an Oily Plasticizer. H. T. Kraft, assignor to General Tire & Rubber Co., both of Akron, O.
2,358,359. Active Carbon Production. K. B. Sturatt, Denver, Colo., assignor to Colorado Fuel & Iron Corp., a corporation of Colo.
2,358,444. Copolymer of an Ester of an Alpha Methylene Monocarboxylic Acid with 0.5 to 10%, by Weight Thereof, of a (2-Vinylethynyl) Carbonyl. D. D. Coffman and C. E. Denoon, Jr., assignors to E. I. du Pont de Nemours & Co., Inc., all of Wilmington, Del.

2,358,628. Dielectric Compositions Including Halogenated Aryl Hydrocarbons Blended with an Amount up to about 1% Effective to Retard Thermal Deterioration of Nitrochlor Diphenyl. Which Is Derived by the Nitration of Chlorinated Diphenyl. F. M. Clark, Pittsfield, Mass., assignor to General Electric Co., a corporation of N. Y.
2,358,683. Treating Dry, Communited Potentially Adhesive Material Containing a Substantial Amount of a Water-Soluble Synthetic Resin in Finely Divided Dust-Forming Condition with a Small Percentage of a Fluid Oily Liquid Substantially Insoluble in Water to Reduce the Tendency of the Fine Particles to Form Dust and Cling to Tools so That the Resin Becomes More Easily Miscible with Aqueous Diluents. L. Bradshaw and C. F. MacLagan, both of Bainbridge, assignors to Bordon Co., New York, both in N. Y.

2,358,694. Composition Including a Polymer of the Class of Polymerizates of a 2-Halobutadiene-1,3, Polymerizates of Butadiene-1,3, Polymerizates of 2-Halobutadiene-1,3 and Another Polymerizable Compound, Other Than Butadiene-

1,3, Containing an Olefinic Linkage, and Polymerizates of Butadiene-1,3 and Another Polymerizable Compound Containing an Olefinic Linkage, and, as Sotening Agent therefor, a Halogenated Alkyl Ether. T. W. Evans, Oakland, assignor to Shell Development Co., San Francisco, both in Calif.
2,358,715. Vulcanizing a Rubber in the Presence of a Compound of the General Formula



Where R is an Organic Radical with the Free Valence on a Carbon Atom, A an Alkylene Group, Y a Saturated Monovalent Hydrocarbon Group. P. C. Jones and A. W. Sloan, both of Akron, O., assignors to B. F. Goodrich Co., New York, N. Y.

2,358,716. Compound of the Formula



Where R is an Organic Radical with the Free Valence on a Carbon Atom, Y is a Hydrocarbon Radical with a Valence not Greater Than 2, and n is Equal to the Valence of Y. P. C. Jones and A. W. Sloan, both of Akron, O., assignors to B. F. Goodrich Co., New York, N. Y.

2,358,717. Rubber Vulcanized in the Presence of a Metallic Salt of a 2-Mercapto Thiazoline, and in the Presence of a Member of the Class of Monocarboxylic Acids and Their Salts with Metals Capable of Forming Activating Oxides, and in the Absence of More Than the Stoichiometric Amount of Activating Metallic Oxides Sufficient to React with the Acidic Constituents of the Composition during Its Vulcanization. P. C. Jones, Silver Lake, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,358,833. The Use of a Small Amount of the Aldehyde Oxidation Product of the Tertiary Butyl Ether of O-Tertiary Butyl p-Cresol to Retard the Oxidation of an Organic Material Subject to Deterioration by Atmospheric Oxygen. W. M. Smith, Baton Rouge, La., and C. J. Willson, Westfield, N. J., assignors to Standard Oil Development Co., a corporation of Del.

2,359,038. Interpolymerization Products of Vinyl Chloride and a Tetrahydrophthalic Acid Ester. H. Hopff and W. Rapp, Ludwigshafen-on-the-Rhine, Germany, assignors by mesne assignments to General Aniline & Film Corp., New York, N. Y.

2,359,039. Monocycloalkyloxy Ketones. C. D. Hurd, Evanston, Ill., assignor to Commercial Solvents Corp., Terre Haute, Ind.

2,359,103. Forming Plasticized Resin by Copolymerizing Styrene and Maleic Anhydride in Solution in a Compound Selected from a Group Consisting of Nitroalkanes Containing 1 to 4 Carbon Atoms in the Hydrocarbon Group and the Hydroxy Derivatives of the Nitroalkanes. H. L. Gerhart and G. E. Eilerman, both of Milwaukee, Wis., assignors to Pittsburgh Plate Glass Co., a corporation of Pa.

2,359,122. Reclaiming Scrap Containing a Vulcanized Copolymer of Butadiene-1,3 and a Compound Containing a Single



Group and is Copolymerizable therewith, by Heating in a Subdivided State at a Temperature from 300 to 420° F. in the Presence of a Di(Hydroxyaryl) Sulphide. W. G. Kirby and L. E. Steinle, Naugatuck, Conn., assignors to United States Rubber Co., New York, N. Y.

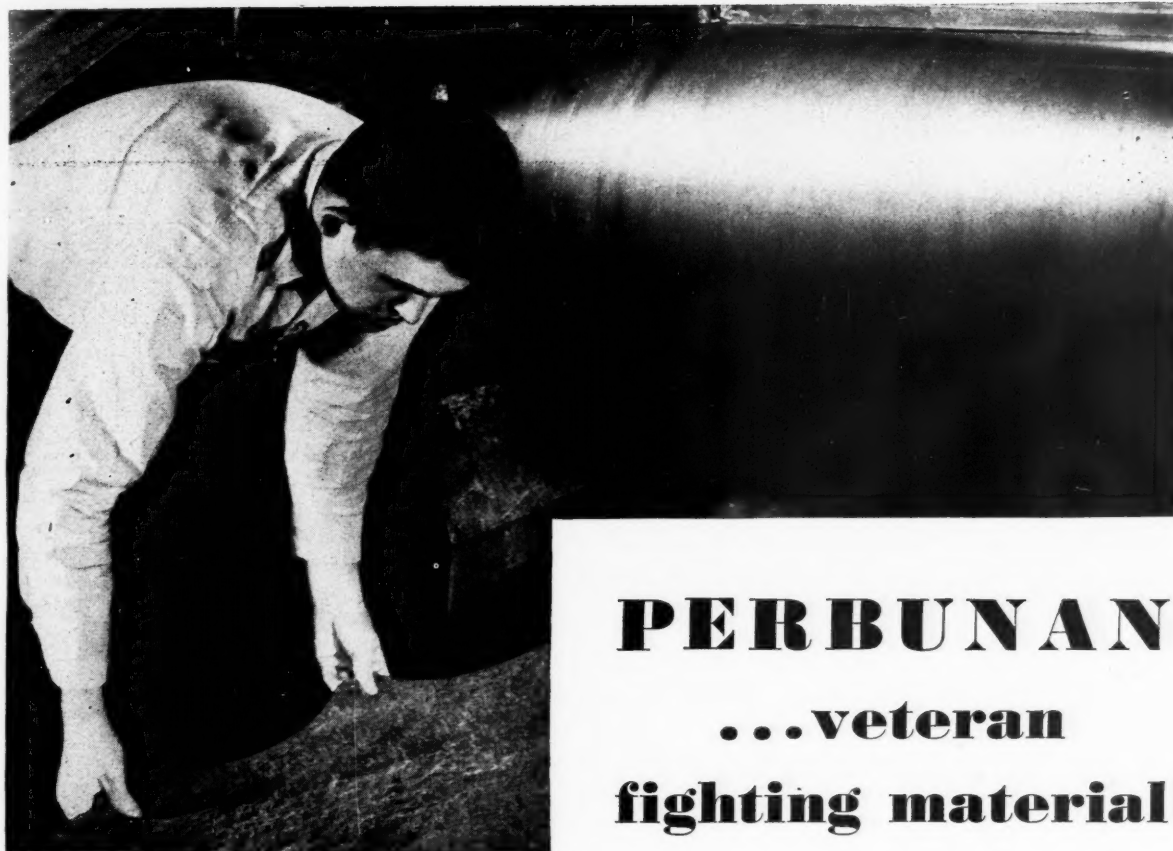
2,359,196. Production of Vinyl Aromatic Resins from an Aqueous Acidic Emulsion of a Vinyl Aromatic Compound; the Emulsion Has a pH Value between 1.5 and 3 and Contains a Water-Soluble Peroxide. C. Britton and W. J. LeFevre, assignors to Dow Chemical Co., all of Midland, Mich.

2,359,212. Depolymerizing Polystyrene by Heating to between 250 and 600° C. by Passing Superheated Steam of at Least as High a Temperature into Contact therewith and Condensing the Styrene Evolved together with the Steam. J. C. Frank and J. L. Amos, both of Midland, and A. F. Straubel, Auburn, assignors to Dow Chemical Co., Midland, both in Mich.

Dominion of Canada

422,324 and 422,325. Carbon Black Preparation. Binney & Smith Co., New York, N. Y., assignee of M. R. Vogel, Easton, Pa., and J. W. Snyder, Scotch Plains, N. J., all in the U. S. A.
422,334 and 422,335. Titanium Oxide. Canadian Industries, Ltd., Montreal, P. Q., assignee of C. M. Olson, Wilmington, Del., U. S. A.
422,336. Solid Composition of Matter Consisting of an Intimate Mixture of a High Molecular Weight Polymer of Ethylene and Carbon Black. Canadian Industries, Ltd., Montreal, P. Q., assignee of B. J. Haggood, Manchester, Lancaster, England.
422,337. Polystyrene Plastic Having a Nacreous Sheen. Canadian Industries, Ltd., Montreal, P. Q., assignee of D. A. Fletcher, Bloomfield, N. J., U. S. A.

422,345. Coating Composition Including as Vehicle an Organic Film-Forming Material Which on Drying, Yields a Resinous Film, and Pigments.



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The Perbunan synthetic rubber being manufactured here has already gone to war. Perhaps it forms a vital part of a bomber's hydraulic system, or maybe it is in a tank, or on a battleship in the South Pacific. Wherever it is, it is doing a war job—a fighting job at which it is a veteran material.

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a necessity in many applications—for in many circumstances, it works better than natural rubber.

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OIL, COLD, HEAT AND TIME**

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- Canadian Industries, Ltd., Montreal, P. Q., assignee of L. Balassa, Flint, Mich., U. S. A.
- 422,346. Molded Articles of Synthetic Resins Having a Color Gradation. Canadian Industries, Ltd., Montreal, P. Q., assignee of W. E. F. Gates, Welwyn Garden City, Herts, England.
- 422,362. Alpha-Beta Unsaturated Mono-Carboxylic Acid. B. F. Goodrich Co., New York, N. Y., assignee of F. E. Kung, Akron, O., both in the U. S. A.
- 422,379. Making a Di(Arylene Thiazyl) Disulphide by Oxidizing the Corresponding Mercapto Arylene Thiazole. Monsanto Chemical Co., St. Louis, Mo., assignee of R. L. Sibley, Nitro, W. Va., both in the U. S. A.
- 422,460. Clear and Homogeneous Plastic Compositions Essentially Free of Uncoiled Particles from Polyvinyl Partial Acetal Resins. Carbide & Carbon Chemicals, Ltd., Toronto, assignee of H. L. Cox, South Charleston, W. Va., and J. D. Matlack, Akron, O., both in the U. S. A.
- 422,461. Heat Stable Vinyl Resin Composition in Which Is Dispersed as Stabilizing Material a Member of the Group of Organo-Metallic Lead and Tin Salts of a Carboxylic Acid. Carbide & Carbon Chemicals, Ltd., Toronto, Ont., assignee of V. Yungve, Lakewood, O., U. S. A.
- 422,604. Preparing an Oil-Soluble Resinous Composition by Reducing Para-Hydroxy Amyl Benzoate and Formalin in the Presence of a Small Amount of Oxalic Acid and Dehydrating the Resulting Mass. Canadian General Electric Co., Ltd., Toronto, Ont., assignee of G. F. D'Alorio, Pittsfield, Mass., U. S. A.
- 422,605. Heat-Hardenable Resinous Composition from Ingredients Including a Urea, an Aliphatic Aldehyde, and a Chlorinated Acetamide. Canadian General Electric Co., Ltd., Toronto, Ont., assignee of G. F. D'Alorio, Pittsfield, Mass., U. S. A.
- 422,628. Production of Thermosetting Resins by Condensing a Polybasic Carboxylic Acid Anhydride with the Product of a Reaction in Alkaline Solution of a Polyhydric Phenol and Epichlorohydrin, the Product Contains at Least Two Ethylene Oxide Groups. Gebr. de Trey A. G., assignee of P. Castan, both of Zurich, Switzerland.
- 422,730. Production of a Styrene Polymer by Polymerizing Monomeric Styrene at Low Temperature to Obtain a High-Grade Styrene Polymer Containing a Minor Proportion of Styrene Monomer, and Removing the Monomer with an Organic Solvent Which Will not Affect the Polymer. Allied Chemical & Dye Corp., assignee of Barrett Co. (by its trustees on dissolution), both of New York, N. Y., assignee of W. A. King, Memphis, Tenn., both in the U. S. A.
- 422,894. Production of Normally Solid Heat-Fusible Thermoplastic Composition from a Vinyl Resin Mixed with a Fusion-Temperature-Lowering Agent of the Group of Pyrones and Pyrones. Carbide & Carbon Chemicals, Ltd., Toronto, Ont., assignee of C. O. Strother, Buffalo, N. Y., U. S. A.
- 422,895. Preparing an Abrasive Article by Mixing Rubber, Sulphur, and a Substance of the Group of Boric Oxide and Hydrated Boric Oxide with Abrasive Grain, Shaping the Mixture, and Curing. Carborundum Co., assignee of G. Van Nimwegen and C. E. Wooddell, all of Niagara Falls, N. Y., U. S. A.
- 422,906. Vulcanized Product Consisting of Rubber, an Accelerator, and 1% to 3% Hydrogenated Rosin, Based on the Weight of Rubber; the Hydrogenated Rosin Acts as Activator for the Accelerator. Hercules Powder Co., Wilmington, Del., assignee of C. H. Boys, Drexel Hill, Pa., U. S. A.
- 422,925. Plasticized Composition Including a Polyvinyl Acetal Resin Plasticized with a Branched Chain Saturated Ketone Containing 18 to 24 Atoms, Which Is Obtained by Hydrogenating a Condensation Product of Mesityl Oxide. Shell Development Co., San Francisco, assignee of F. A. Bent, Berkeley, and F. G. Byrne, Oakland, all in Calif., U. S. A.
- 422,926. Polyvinyl Acetal Composition Plasticized with a Partially Hydrogenated Oxide Condensation Product Consisting of a Mixture of Substantially Saturated Ketones and Alcohols, Each Ketone and Alcohol of Which Contain at Least 12 Carbon Atoms per Molecule. Shell Development Co., San Francisco, assignee of F. A. Bent, Berkeley, and F. G. Byrne, Oakland, all in Calif., U. S. A.
- 422,944. Composition Consisting of Low Protein Rubber and Cyclized Rubber. Wingfoot Corp., Akron, assignee of H. R. Thies, Kent, both in O., U. S. A.
- 422,575. Aqueous Dispersions of Resins. American Cyanamid Co.
- 422,583. Thermosetting Molding Powders, and Molded Articles Made therefrom, Including Natural Hornlike Material. M. Kraus.
- 422,590. Molding Powders Containing Synthetic Resins. H. P. Bayon.
- 422,644. Molding Powders. E. I. du Pont de Nemours & Co., Inc., and E. K. Bolton.
- 422,987. Rubber Solutions. H. J. Stern and H. K. E. Surridge.
- 422,047. Dihaloacrylyl Halides. Wingfoot Corp.
- 422,078. Solutions of Polyamides. E. I. du Pont de Nemours & Co., Inc.
- 422,127. Propiolyd Halides. Wingfoot Corp.
- 422,164. Anhydrous Ketones. Shell Development Co.
- 422,175. Preservation of Rubber. Monsanto Chemical Co.
- 422,209. Stabilization of Polyvinyl Alcohol. E. I. du Pont de Nemours & Co., Inc.
- 422,271. Fused Heavy Metal Resinates. L. Mellersh-Jackson, (Hercules Powder Co.).
- 422,344. Resinous Composition. Norton Grinding Wheel Co., Ltd.
- 422,375. Resinous Condensation Products. British Thomas-Houston Co., Ltd.
- 422,429. Antioxidant. B. F. Goodrich Co.
- 422,494. Rubber-Like Compositions. Resinous Products & Chemical Co.
- 422,554. Alkyd Resins. Hercules Powder Co.
- 422,624. Adhesive Compositions. British Thomas-Houston Co., Ltd.
- 422,625. Plastic Compositions. Pirelli-General Cable Works, Ltd., and H. Barron.
- 422,635. Plasticized Composition, Plasticizer therefor, and Process of Producing the Plasticizer. Sylvania Industrial Corp.
- 422,707-763,713. Textile Treating Materials and Their Application. E. I. du Pont de Nemours & Co., Inc.
- 422,720. Copolymers of Vinyl Chloride. Wingfoot Corp.

MACHINERY

United States

- 2,357,360. Apparatus for Making Molded Rubber Footwear. E. Rollmann, Brussels, Belgium, assignor to H. Rollman, Kew Gardens, N. Y.
- 2,357,845. Machine to Apply Thermoplastic Adhesive in Fluid Form to Web Material. R. E. J. Nordquist, Maplewood, N. J., assignor to American Can Co., New York, N. Y.
- 2,357,960. Vulcanizing Kettle. W. H. Kuster, San Francisco, and E. A. Glynn, Lodi, both in Calif.
- 2,358,176. Apparatus for Forming an Article of Plastic, but Distortion-Resisting Rubber-Like Material. F. J. MacDonald, Brookline, Mass., assignor to B. F. Goodrich Co., New York, N. Y.
- 2,358,341. Molds for Women's Rubbers. H. Malm, New York, N. Y.
- 2,358,354. Device for Injection Molding. T. F. Pique, Piqua, O., and I. E. Stewart, Detroit, Mich., assignors to French Oil Mill Machinery Co., Piqua, O.
- 2,358,624. Means for Heating Thermoplastic Materials for Molding. A. A. Burry, Toronto, Ont., Canada.
- 2,358,686. Injection Molding Machine. L. J. Caron, assignor to Leominster Tool Co., Inc., both of Leominster, Mass.
- 2,358,722. Machine for Masticating Rubber. N. W. Lousley, Blackburn, England.
- 2,358,762 and 2,358,763. Vulcanizing Press. L. E. Soderquist, assignor to McNeil Machine & Engineering Co., both of Akron, O.
- 2,358,909. Apparatus for Making Hose. E. A. Davis, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.
- 2,358,935. Apparatus for Applying Treads. C. W. Leguillon, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.
- 2,358,956. Feeding Unit for Injection Molding Machines. B. D. Aschbaugh, Mount Gilead, O., assignor to Hydraulic Development Corp., Inc., Wilmington, Del.
- 2,359,152. Injector Flask for Molding Apparatus. W. J. Pryor, Cleveland, O., and E. J. Frank, assignors to Hanau Engineering Co., Inc., both of Buffalo, N. Y.

Dominion of Canada

- 422,650. Device for Making Contoured Floor Covering for Automobile Floors. Mishawaka Rubber & Woolen Mfg. Co., assignee of G. W. Blair and J. F. Schott, all of Mishawaka, Ind., U. S. A.
- 422,711. Tire Retreading Mold. P. E. Hawkinson, Minneapolis, Minn., U. S. A.
- 422,769. Apparatus to Form Latex Articles. Harrison & Morton Laboratories, Inc., assignee of M. M. Harrison, both of Cuyahoga Falls, O., U. S. A.
- 422,792. Autoclave Closure. Rubatex Products, Inc., New York, N. Y., assignee of H. Pfeumer, New Brunswick, N. J., both in the U. S. A.

UNCLASSIFIED

United States

- 2,357,807. Pressure Regulator for Pneumatic Tires. A. Boynton, San Antonio, Tex.
- 2,357,856. Hardness Tester. D. R. Tate, Arlington, Va., assignor to the Government of the United States, as represented by the Secretary of the Department of Commerce.
- 2,357,998. Mold for Spliced Cable Joints. J. W. Campbell, Paterson, N. J.
- 2,358,065. Machine for Movably Carrying Long Lengths of Plastic Sheet. J. B. Hale, assignor to Eastman Kodak Co., both of Rochester, N. Y.
- 2,358,138. Apparatus for Dusting Rubber Goods. C. E. Blanchard, Randolph, and A. W. Ferre, Wellesley, assignors to B. F. Sturtevant Co., Boston, all in Mass.
- 2,358,370. Instrument to Indicate Pressure in a Pneumatic Tire on an Airplane Landing Wheel. W. Williams, Columbus, O.
- 2,358,575. Hose Clamp. J. F. Hurley, Spokane, Wash.
- 2,358,635. Hose Handling Apparatus. A. L. Grise, Springfield, assignor to Gilbert & Barker Mfg. Co., West Springfield, both in Mass.
- 2,358,946. Clamping Support for Cables. N. A. Tornblom, Chicago, Ill., assignor to Appleton Electric Co., a corporation of Ill.
- 2,359,044. Impact Tester. H. L. MacBride, assignor to Tinius Olsen Testing Machine Co., both of Philadelphia, Pa.
- 2,359,162. Tire Deflating Device. W. E. Sherrbondy, Shaker Heights, O.

Dominion of Canada

- 422,300. Dual Wheel Assembly. C. S. Ash, Milford, Mich., U. S. A.
- 422,307. Non-skid Device. D. S. Kennedy, Andover, Hampshire, England.
- 422,354. Device for Indicating Deflation of Aircraft Tires. Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont., assignee of H. R. Fletcher, Birmingham, Warwick, England.
- 422,356. Cord or Yarn for Tires. Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont., assignee of J. Anderson, Birmingham, Warwick, and M. Langstreth, Rochdale, Lancashire, both in England.
- 422,369. Means for Testing Electric Cable Insulation. International Standard Electric Corp., New York, N. Y., U. S. A., assignee of J. H. Gosden and E. C. Lee, both of London, England.
- 422,409. Tire Valve Tool. F. A. Emmel, Toronto, Ont.
- 422,534. Apparatus for Controlling Unstable Resistor Temperature. Newton Research Laboratories, Inc., Indianapolis, Ind., assignee of L. H. Davis, Cleveland, O., administrator of the Estate of J. Ferguson, deceased, in his lifetime of Cleveland, both in the U. S. A.
- 422,706. Tire Guard for Straddle Truck. C. L. Aerni, Ferriday, La., U. S. A.
- 422,947. Forming a Lap joint in the Heat-Sealable Plastic Lining of a Metal Tank. Wingfoot Corp., assignee of L. A. Carney, both of Akron, O.

United Kingdom

- 562,328. Reinforcement of Flexible Tubes. Wallington, Weston & Co., Ltd., and F. Bentley.
- 562,352. Hosepipe Connection. Power Flexible Tubing Co., Ltd., (Meyer-Keller & Cie, A.G., O.).
- 562,382. Bead Lock Rings and Assemblies for Pneumatic Tires. Wingfoot Corp.
- 562,643. Bead Locks for Tire and Rima Assemblies of Wheels. Firestone Tire & Rubber Co.
- 562,942. Apparatus for Indicating and Locating Breaks in Insulated Electrical Conductors. Durham Cables, Ltd., and N. Stell.
- 563,248. Wheel Assemblies for Cooperation with Endless Tracks. H. G. C. Fairweather, (B. F. Goodrich Co.).
- 563,475. Containers for Fluids under Pressure. Firestone Tire & Rubber Co.
- 563,650. Containers. Firestone Tire & Rubber Co.

United Kingdom

- 562,304. Artificial Resins from Phenols and Aminoarizines. Soc. of Chemical Industry in Basle.
- 562,331. Polymerization Products of Cyanamide and of Artificial Resins therefrom. Soc. of Chemical Industry in Basle.
- 562,332. Resinous Condensation Products. British Thomas-Houston Co., Ltd.
- 562,358. Synthetic Resinous Materials. E. H. G. Sargent.
- 562,370. Production of Polyamides. Imperial Chemical Industries, Ltd. (E. I. du Pont de Nemours & Co., Inc.).
- 562,373. Resinous Condensation Products. British Thomas-Houston Co., Ltd.

Erasing A PRODUCTION PROBLEM

SUN RUBBER PROCESSING OIL

Eliminates Greasy Surface Appearance of Rubber Erasers

Appearance is extremely important in many rubber products. And Sun Rubber Processing Oil has helped a number of rubber manufacturers to improve the condition of the surface and consequently the sales appeal of their products. In one such case, a large and well-known manufacturer of lead pencils, erasers and other kindred products, consulted a Sun Engineer on a special problem.

A greasy surface was hampering sales of their erasers. The Sun Technical man believed that the processing oil being used was the cause of the trouble and suggested trying a Sun Rubber Processing Oil. The greasy surface was from all practical purposes eliminated. When the war restrictions are lifted, this condition will be completely abolished.

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Whether your production problem is a matter of product appearance, excessive milling time, high costs or some other factor, discussion with a Sun Technical man may help you to solve it . . . just as it has helped hundreds of other manufacturers. Lubrication of rubber mill machinery also presents many problems that a Sun Lubrication Engineer backed by the complete line of Sun Industrial Lubricants can help you to overcome. Contact your nearest Sun office for complete service or write to



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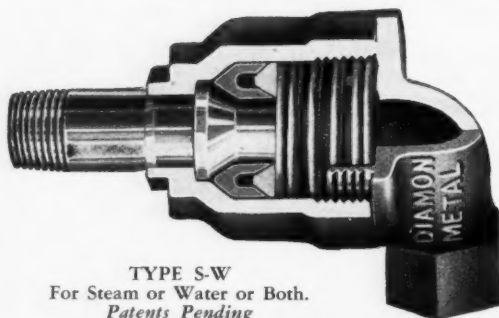
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HELPING INDUSTRY HELP AMERICA

Month After Month . . .

Year After Year . . .

NEVER A LEAK



TYPE S-W
For Steam or Water or Both.
Patents Pending



- Install the swing joint that puts an end to leaking, dripping, repacking and costly shut-downs.
- In the patented Diamond construction, a long-life gasket is held in place by a follower ring pressed against it by a spring which maintains enough pressure to prevent leaks while allowing complete freedom of motion.
- Steam or liquid under pressure on inner part of gasket, forces a leak-proof seat. The higher the pressure the less chance for escapes.
- Many DIAMONDS have been in continuous 24-hour service on alternating steam and cold water for years without failure.

Writes Mr. C. R. Beck of the American Broach & Machine Co., Ann Arbor, Michigan.—

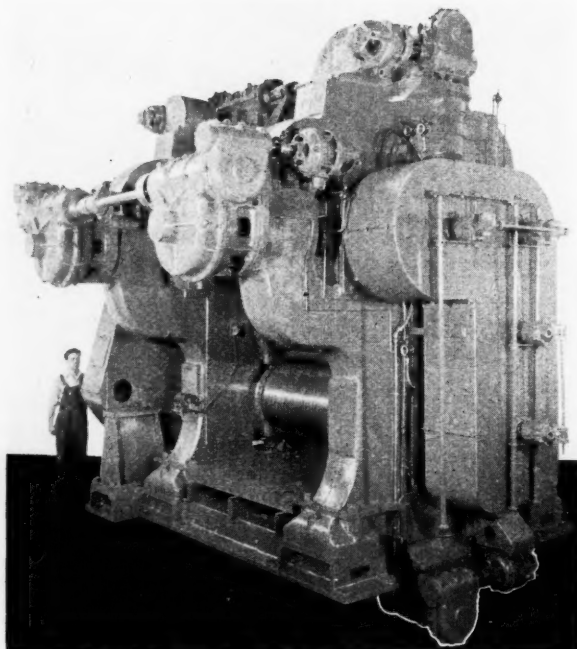
"With reference to the average life of these rings, we believe the ones now being replaced have certainly been in service more than 6 months. Our estimate would be that these have been on the job as long as 2 years. We have no complaints of any kind on your swing joints and they are operating satisfactorily in all cases."

Write today for catalog and prices.

Sizes $\frac{3}{8}$ ", $\frac{1}{2}$ ", $\frac{3}{4}$ ", 1" and $1\frac{1}{4}$ "
Shipped from stock. No waiting.

DIAMOND METAL PRODUCTS CO.
406 Market St., St. Louis 2, Mo.

New Machines and Appliances



Improved Four-Roll Calender

Calender Features Improved Roll Adjustment

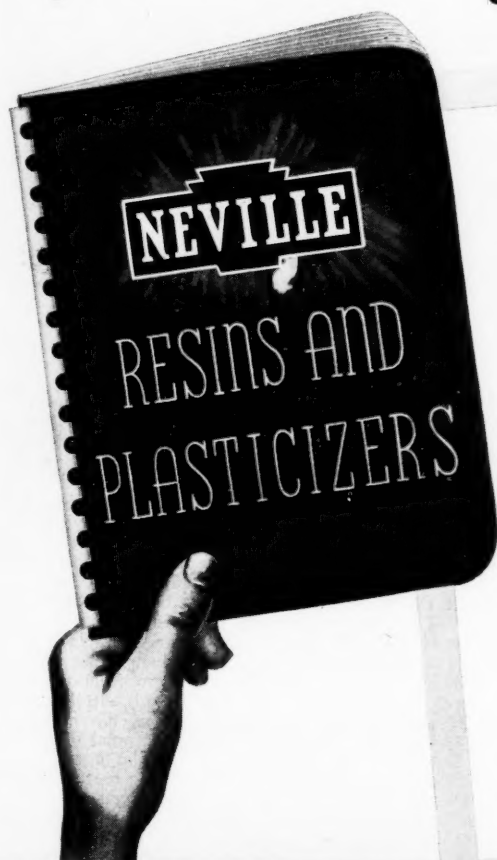
IMPROVED design of a four-roll double-coating calender is reported to result in more efficient operation and improvement of product quality. The calender is proportioned in size and weight to the large rolls, which offer more than three times the resistance to deflection ordinarily provided. An improved type of roll adjustment has an individual motor for each screw of the top, bottom, and side rolls. These adjustments permit precision control of gage, automatically or manually, and the gage can be instantly corrected to maintain uniform thickness at the edges. Each screw can be operated independently to adjust one end of a roll, but is



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IT'S Neville's latest hand-book on Resins and Plasticizing Oils, containing a wealth of information that should prove a convenient guide to the proper selection of the right Neville product to meet your problems.

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HI-FLASH SOLVENTS · COUMARONE-INDENE RESINS · PHENOTHIAZINE · TAR PAINTS
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RECLAIMING, PLASTICIZING, NEUTRAL, CREOSOTE, AND SHINGLE STAIN OILS

A-15

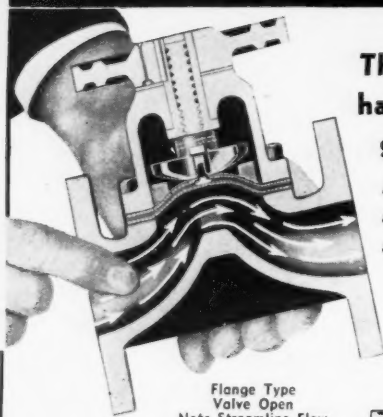
Banish Valve Troubles

INSTALL

HILLS-McCANN

SAUNDERS PATENT

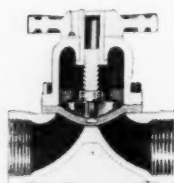
DIAPHRAGM VALVES



Flange Type
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Note Streamline Flow

The Valve that
has nothing to
go wrong

A positive defense
against corrosion
and erosion.



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Valve Closed

USE THEM on your pipe lines handling Emulsions, Latex, Soap Solutions, Mineral Acids, Alcohol, Salt Solutions, Compressed Air, Hot or Cold Water, Gases, Etc.

Hills-McCanna Valves give you a new standard of valve performance, because their construction is a complete departure from the conventional—no seats to wear—no ports to clog—no packing necessary—no corrosion—hence, leaking, sticking, freezing, wire-drawing, galling and expensive repairs and replacements are all eliminated.

Available in sizes from 1/2" to 14" Screw and Flanged Types. Flanged types furnished with glass, lead or rubber lined bodies if desired.

Write for Catalog V-44.

HILLS-McCANN CO.

2364 NELSON STREET, CHICAGO, 18

PROPORTIONING PUMPS • AIR & WATER VALVES • CHEMICAL VALVES
MARINE VALVES • FORCED-FEED LUBRICATORS • DOWMETAL CASTINGS

also synchronized for parallel adjustment. Lubricating systems for various moving parts have been incorporated in the design to increase operating efficiency, lessen maintenance, and lengthen the period of service of the calender. Farrel-Birmingham Co., Inc., Ansonia, Conn.



E. I. du Pont de Nemours & Co., Inc.

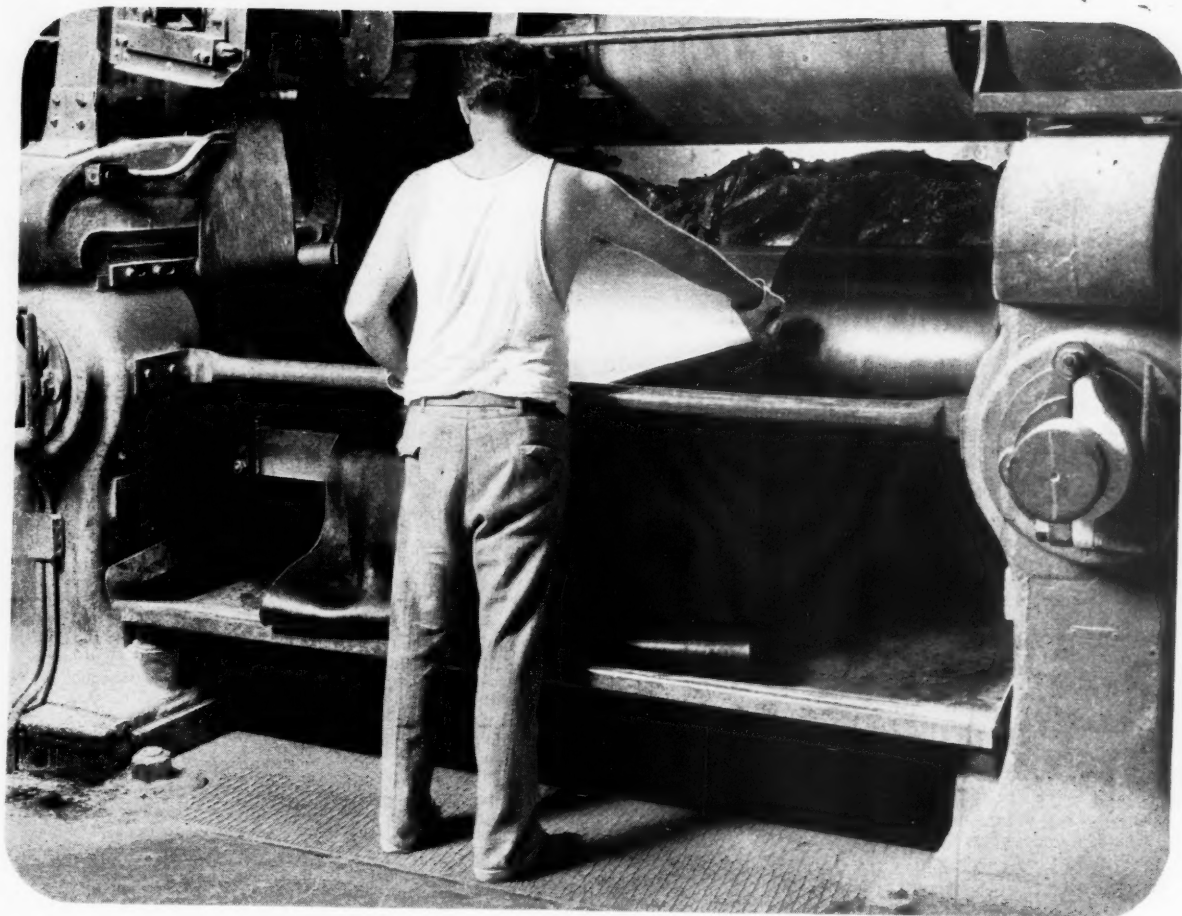
High-Speed Wire Plating Machine

Copper Wire-Plating Machine

A WIRE-PLATING machine to utilize the du Pont Halogen tin plating solution is reported to facilitate the coating of copper electrical wire ranging in sizes from those about as thin as a human hair up to heavy gages. Wires only five-thousandths of an inch thick can be coated at the rate of 800 feet per minute without breakage, and heavier strands may be put through at even higher speeds. This electro-tinning process is said to require only half as much tin as do older methods. The tin is deposited without producing an alloy and therefore does not affect the resistivity or elongation, and the electrolytic bath does not become contaminated with copper. The plating apparatus is arranged so that there is a minimum of drag and tension on the wire. The wire passes swiftly in and out of seven tubs of cleaning and plating solutions without touching the rims of any. It emerges from the baths with its smooth new coat of tin untouched by any metal or other solid material and therefore unscratched. This dip method is achieved by keeping the tubs full of fluid to the point of running over. The fluid is saved by recirculation. The baths are so placed that the wire passes through the heaped up part, called the inverted meniscus, just missing the rims of the vessels. Excess fluid between the baths is removed by compressed air blasts. These arrangements not only subject the wires to a minimum of handling, but facilitate stringing them up for the start of a plating run. They are simply laid over the top of the baths and attached to "let-off" and "take-up" spools at the two ends of the apparatus. National Standard Co., Niles, Mich.

COLOMBIA

Following the purchase of a half-interest in the Compania Croyden de Pacifico S. A., in Colombia, by a United States rubber company, a plan for increasing outputs of present products and introducing new lines has been announced. The plant is to be modernized and placed under the supervision of United States technicians. A new unit for making hose and belting is being added; camelback production on modern lines will be started. The present output of footwear in which synthetic rubber is used is to be increased to 2,000 pairs a day, and, finally, it is expected also to manufacture drug-gists' sundries from synthetic rubber.



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Get these 5 Big Advantages with S/V Sovaloid "C"

- 1 Shorter GR-S milling and compounding time.
- 2 Easier milling, calendering and extruding.
- 3 Smooth calendered and extruded stocks.
- 4 Excellent elasticity, aging and long wear properties.
- 5 Good electrical characteristics.

Available Now for Processing GR-S

S/V Sovaloid "C" gives you a superior plasticizer designed especially for processing GR-S.

It's a proved product. Mills using it find that it cuts production time and costs; that it delivers all the advantages listed at left.

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Technical and U.S.P. Grades

(MAGNESIUM OXIDE)

EXTRA LIGHT

The Original Neoprene Type

A supreme quality product for the rubber trade. Extremely fine state of division. Improves storage stability and resistance to scorching. A curing agent unexcelled for increased modulus, greater resilience, reduced heat build-up, lower compression set and retention of tensile strength during heat service.

LIGHT

A high quality product of greater density than "Extra Light," but high in MgO and low in impurities. An excellent value for many uses.

MEDIUM

A good value. Very active. High Magnesia content, low in impurities. Medium density.

HEAVY

All types can be furnished. Specially ground to meet the exacting Code Pigment Specifications of the Rubber Trade. Unground types for chemical uses.

PACKAGES—Specially designed to protect contents from moisture and air. Corrugated carton with special water-proof liner, and inner paper liner. Five-ply multi-wall bag, including asphalt liner.

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Miller & Co.
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& Chemical Co.

EUROPE GREAT BRITAIN

Weight of Rubber Hydrocarbon during Reclaiming

In the June 17 issue of *India Rubber Journal* appeared a translation of an article by W. Esch in which it was remarked that during reclaiming the mean molecular weight of the rubber hydrocarbon decreases until lower fractions become soluble in acetone and have the effect of increasing the acetone extract to the apparent disadvantage of the rubber hydrocarbon content as estimated by the usual "difference" method; hence these analyses give rubber hydrocarbon content (RHC) values which are too low and that the figure should be adjusted when designing compounds.

In a letter in the August 26 issue of the paper, R. G. Newton, of the Research Association of British Rubber Manufacturers, commenting on this article, states: "While we do not deny that some of the RHC is lost in the acetone extract, we do contend that he (Esch) has ignored more important effects which are operating in the reverse operation. The action of reclaiming does not remove the combined sulphur, and if the material is repeatedly vulcanized with further sulphur and then reclaimed, the combined sulphur content will continue to rise until, after about five stages in the process, the 'rubber' becomes unusable. We contend that the part of the rubber chain-molecule which is combined with sulphur is no longer properly available for revulcanization from the point of view of soft vulcanizates, and hence the RHC, as obtained by the indirect method will be too large by the amount of 'rubber-combined-with-sulphur' and this quantity may be larger than the amount lost in the acetone extract. It is," he continues, "a matter of considerable interest to note that the direct method of determining the RHC does not take account of that part which is combined with sulphur."

Mr. Newton then goes on to support his statement and concludes that the direct method gives a truer value of the RHC which is available for vulcanization and that the values obtained by the "difference" method may be too high and not too low, as W. Esch claimed.

Identifying Synthetic Rubbers

In the same letter Mr. Newton offered a simple method of identifying synthetic rubbers. In an earlier issue of the *India Rubber Journal*, N. G. Quinn had stated that if any kind of flame were applied to the corner of a rubber specimen, chlorine-containing rubbers could be detected by the fact that the extreme fringe would have a characteristic emerald tint. Mr. Newton confirmed that chlorine-containing rubbers do give a green flame, but the green color can also be obtained with other synthetic rubbers (as some samples of Stanco Perbunan) which do not contain chlorine. Consequently he recommends a different test, equally simple, but more reliable. He heats a piece of clean copper wire (about one millimeter- $\frac{1}{2}$ -millimeter, diameter) to bright red heat in a non-luminous gas flame, then immediately plunges it into a corner of the test piece. The wire is then put back into the flame when a transitory green flash indicates the presence of chlorine.

Meetings Scheduled

The Institution of the Rubber Industry has announced its program of papers for the 1944-45 session for the London and Midland Sections, as below:

London Section:

September 4, "The Behavior of Rubber in Mixed Liquids", G. Gee.
October 2, "Inside the American Rubber Industry", L. E. Masheter.
October 30, Symposium, "Postwar Trends in the Rubber Industry."
November 27, "The Variations with Temperature of the Dynamic Properties of Compounded Rubber", W. P. Fletcher.
January 1, 1945, Papers on high frequency and radiant heating by N. R. Bligh and I. J. C. Connell.
February, 1945, "New Methods of Molding", S. Buchan.
March, 1945, "Carbon Blacks in Synthetic Rubbers", D. Parkinson.
April, 1945, "Pictorial Story of the Rise of the American Synthetic Rubber Factories", T. R. Dawson.

Midland Section:

September 11, "Inside the American Rubber Industry", L. E. Masheter.

SEND FOR SAMPLE

MONSANTO GVL

A Completely Water-Miscible
Solvent with a Wide Range
of Possibilities

Gamma Valerolactone is an unusual solvent that has a wide range of possibilities in the manufacture of war-essential products. Samples for experimental purposes will be sent free and without obligation in response to requests on company letterheads.

Monsanto GVL, which is non-irritating and safe for all normal uses, is completely miscible with water. It also is miscible with most organic solvents and plasticizers and with resins, waxes, oils, fats and acids, except anhydrous glycerine, polyvinyl alcohol, glue, casein, gum arabic and soya bean protein. It is slightly miscible with zein, degreas, beeswax, petrolatum and mineral spirits.

If physical properties of Monsanto GVL suggest possible applications in your war production, we shall be pleased to supply you with a sample. Please address your inquiry to the nearest Monsanto Office or to MONSANTO CHEMICAL COMPANY, Rubber Service Department, Second National Bldg., Akron, Ohio. Telephone: HEmlock 6191.

PHYSICAL PROPERTIES

Appearance	Colorless, mobile liquid
Formula	$C_5H_8O_2$
Molecular Weight	100.06
Boiling Point (760 mm.)	205-206.5° C.
Flash Point (Cleve. Open Cup)	205° F.
Fire Point (Cleve. Open Cup)	220° F.
Crystallizing Point	-37° C.
Specific Gravity @ 25/25° C.	1.0518
Refractive Index @ 25° C.	1.4301
Surface Tension @ 25° C.	39. dynes/cm.
Viscosity @ 25° C.	2.18 Centipoises
pH (Anhydrous)	7.0
pH of 10% Solution in Distilled H_2O	4.2

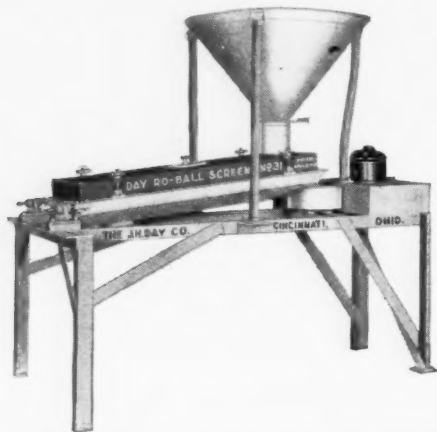
POSSIBLE FIELDS OF APPLICATION

1. As a coupling agent in dye baths.
2. In brake fluids.
3. In cutting oils.
4. As a solvent for insecticides and fungicides.
5. As a lacquer solvent to reduce blush.
6. As a solvent for adhesives.



Ro-Ball Screens for the Rubber Industry

The action of the screen box, which operates at a nearly level angle, combines with the Day Super-Active Ball Cleaning Device to produce an effective screening action.



The Ro-Ball above is a No. 31, Hopper Feed, Closed Top Type which is used extensively for processing of natural or compounded rubber products, where sulphur, oxides, etc., are used, and dust tight construction is required.

These machines can be furnished in either single or multiple screen construction and in various sizes to meet all requirements.



The open construction shown above is used extensively for dewatering operations where caustics are used in reclaiming rubber. These units can be furnished in various sizes to meet all production requirements.

The J.H. DAY Company
CINCINNATI 22 OHIO.

October 9, "Nylon Yarn and Its Use in Tire Cord", G. Loasby. (Joint meeting with the Institute of the Plastics Industry, Midland Section.)

November 13, "Tire Balance", C. L. S. Gifford and J. H. Hardman.

December 11, To be arranged.

January 8, 1945, "The Electron Microscope", D. G. Drummond.

February 12, "The Electrical Conductivity of Rubber", G. Bulgin.

March 12, "Rubber Chemicals: Past and Future Influence of Synthetic Rubber", W. J. S. Naunton. (Joint meeting with Royal Institute of Chemistry.)

April 9, "Factory Problems with GR-S", H. Wilshaw.

May 12, Symposium, "The Physical and Chemical Breakdown of Rubber."

May 14, Annual general meeting.

British Rubber Industry Notes

A commercial research committee has been formed by the Netherlands Chamber of Commerce in London to study special subjects which affect or are likely to affect trade between the Netherlands and her colonies and the British Commonwealth of Nations.

The Goodyear Tire & Rubber Co. (Great Britain), Ltd., at Wolverhampton has installed a large amount of new machinery for processing synthetic rubber by the new method recently developed by the parent company of Akron, O., U. S. A.

EUROPEAN NOTES

The Spanish Government has reportedly authorized the construction of a new synthetic resin factory at Maturo, near Barcelona. At Cardona, north of Barcelona, an electro-chemical plant for producing caustic soda, chlorine, and hydrogen is planned.

Early in October the Ljungaværk neoprene factory in central Sweden was forced to shut down temporarily following a violent explosion which injured six persons and damaged machinery and equipment. The factory had only begun operations last June.

LATIN AMERICA BRAZIL

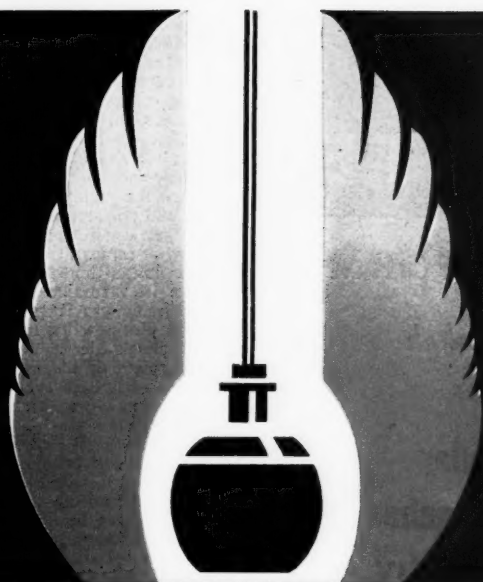
Development of Plastics Industry

The molding of plastics is a fairly recent development in Brazil which in the 1939-1941 period expanded comparatively rapidly. Since then war conditions have acted as both a stimulus and a curb, for while the increased industrial pace forced by these conditions created an unusual demand for plastic goods, the lack of raw materials, which for the most part had to be imported (in prewar times chiefly from Germany), made it impossible to take the fullest advantage of this demand.

The shortage of raw materials was especially acute in 1942. Official statistics show that in that year Brazilian imports of bakelite and similar products had fallen to 79 metric tons from an annual average of 116 tons in the period 1939-1941 inclusive; imports of phenol used in the local manufacture of bakelite, were only 44 tons, against an average of 145 tons; miscellaneous plastics materials or synthetic resins, not specified, were 56 tons instead of 94 tons. The situation seems to have been even worse in the case of thermosetting materials like phenol-formaldehyde resins and urea-formaldehyde resins, of which the combined consumption in 1941 had been around 250 metric tons; while an additional 100 tons of phenol-formaldehyde had been used in the paint industry. The shortage, occurring in a period of unprecedented demand for plastics and articles made from them, favored the development of a black market, particularly in phenol-formaldehyde resins.

The only plastic that seems to have remained freely available, although at higher prices, has been locally produced galalith.

It was attempted to ease the situation by investigating possible substitutes of Brazilian origin, but little headway has so far been made in this direction.



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Write for Bulletin "Modern Hydraulic Presses."

Hydraulic Press Division

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PIQUA OHIO

Toward the end of 1943 there was some improvement, and phenol- and urea-formaldehyde resins were in better supply so that manufacturers using these materials were able once more to expand their greatly curtailed output to some extent. The chief products made from the phenolic compounds are accessories for telephone and radio, electrical plugs, various items for military purposes, containers, closures, buttons. The urea-formaldehyde resins are used chiefly for household articles, toys, novelties, and buttons.

Side by side with the molding of thermosetting plastics has developed the molding of thermoplastic materials. Here cellulose acetate and polystyrene are the chief materials employed. In 1939, before war conditions ended it, Brazil obtained polystyrene from Germany at comparatively low prices, and the few injection molders existing at the time preferred it to cellulose acetate not only because of its favorable flow and color properties, but because its lower specific gravity permits a considerably higher yield to be obtained. But now the molders must perforce concentrate on cellulose acetate powders.

The growth of the thermoplastic molding industry in the last three years has been even more pronounced than that of the thermosetting branch, and it is said that there are today three times as many injection molding units in operation in Brazil as there were three years ago. It is estimated that more than 20 firms in Brazil are consumers of cellulose-acetate molding powders and that several more are installing machinery for the same purpose.

Most of the injection machines in use are prewar Eckert-Ziegler imports or have been patterned after these German machines by Brazilian workshops, especially in the last three years. Local molders of thermoplastics are producing an increasing variety of goods; at present their lines include tooth brushes, combs, closures, buttons, slide-fasteners, and many novelties. When peace returns, it is expected that activity in molding both thermoplastics and thermosetting materials will not diminish, but will rather increase, and it is calculated that consumption of thermosetting materials would be at least 500 tons a year, and of thermoplastics, well over 200 tons.

Notes

A new Brazilian wax, similar to Carnauba wax, is said to be obtainable from the leaves of the *Canassu* plant. This plant, said to flourish in the Para highlands, resembles a small banana tree, and the wax is found on the underside of the leaves. But to make post-war production on a commercial scale possible, improved means of extracting the wax will have to be devised.

Business men were recently reminded by the Bank of Brazil that the importation of rubber manufactures into Brazil is still prohibited unless special permission is obtained from the Import and Export Department of the Bank. It was thought necessary to issue this warning because some firms recently experienced difficulty with the importation of rubber goods from the United States.

"The Process of Extruding Natural Rubber, Synthetic Rubber, Plastics, Reclaimed Rubber. B. F. Goodrich Engineering Data." The B. F. Goodrich Co., Akron, O. 80 pages. Several hundred cross-sectional drawings of diversified extruded shapes are preceded by a short illustrated discussion of die making and extrusion processes in this recent publication.



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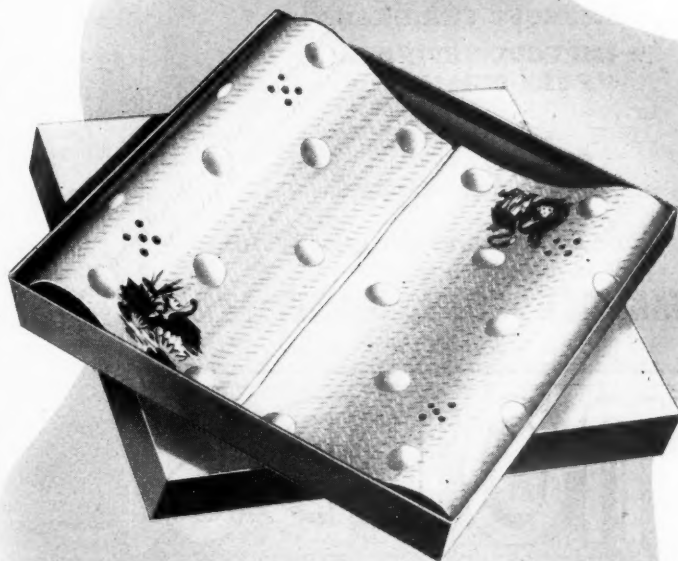
(FOR FURTHER DETAILS, SEE AD ON PAGE 130)

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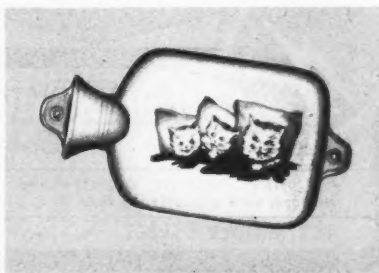
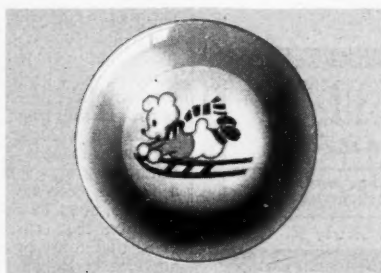
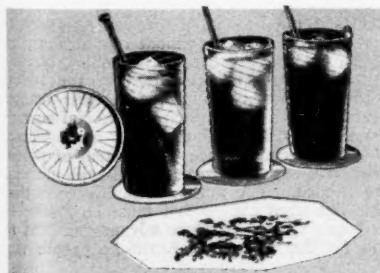
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Editor's Book Table

BOOK REVIEWS

"1944 SAE Handbook." Society of Automotive Engineers, Inc., 29 W. 39th St., New York 18, N. Y. Cloth, 5¼ by 8½ inches, 848 pages. Index. Price \$5.

Wartime industrial and technical progress in developing new methods and materials facilitating production is reflected in the new and revised standards and specifications in the latest annual edition of the official publication of the SAE. Specifications for medium and heavy-duty coolant hoses formulated by the joint ASTM-SAE Technical Committee A on Automotive Rubber are primarily of value as a guide in the selection of materials for use in combat vehicles and others used for less critical and exacting services. Oil-resisting synthetic rubbers are required for combat vehicles; all-reclaim rubber compounds, for moderate-duty coolant hoses.

The Classifications and Physical Requirements for Rubber Compounds specifications have been revised as of January 15, 1944. They are intended as an aid in selecting compounds for automotive and aeronautical rubber. Compounds for tires, tubes, sponge rubber, and hard rubber are not included. The physical requirements are considered adequate as substitutes for both war materials and most ordinary normal requirements.

Cancellations include specifications for rubber hose, clamps, and fittings as published in the 1943 edition.

"Cumulative Index for Volumes I, II, III, IV, V, and VI of 'The Chemical Formulary.'" H. Bennett. Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. Cloth 8¾ by 5½ inches, 164 pages. Price \$4.

Comprehensive and abundantly cross-referenced, this index is arranged in strict alphabetical order to facilitate reference use. It covers all the formulae included in the complete six volumes of "The Chemical Formulary." The more than 200 references to the various rubbers, their compounding ingredients, and rubber products suggest the value of the index as a guide to the contents of the various volumes.

"Chemical Engineering Nomographs." Dale S. Davis. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York, N. Y. 1944. Cloth, 9 by 5¾ inches, 320 pages. Index. Price, \$3.50.

The frequent and practical use of nomography in the chemical and process industries during the past few years has shown the value of nomographs as an efficient reference tool for simplifying and expediting the calculations of chemical engineers and analytical, control, and physical chemists. The author of this volume, who is mathematician for the Wyandotte Chemicals Corp., has included many of his own nomographs and the alignment and line-coordinate charts of others, all heretofore available only in the periodical technical literature of the past 15 years. The 200 charts presented are supplemented with directions for their use and with material indicating their application, limitations, and validity. About 100 of the charts present physical property values. There are several vapor pressure charts, and data on viscosity, density of solutions, specific heat, pH, and gas solubility. Other charts cover the flow of fluids and the contents of horizontal tanks. The charts are readily usable in the standard book-size page. Some require a reference line, but the majority are of the simple three-scale type and may be read with a flat edge.

"The Future Economic Policy of the United States." No. 8 in *America Looks Ahead*, A Pamphlet Series. By William Adams Brown, Jr. Published by the World Peace Foundation, 40 Mt. Vernon St., Boston, Mass. 1943. Cloth, 5¼ by 7¼ inches, 101 pages. Price, 50¢.

Most people in the United States earnestly desire both security and free enterprise. In this discussion of postwar economic problems Mr. Brown suggests a middle road by which this country can achieve the security of the individual without relinquishing the traditional system of free enterprise. Protective tariffs, agricultural subsidies, and other government regulation of the federal economy have tended to give security to people in their occupations. If this trend continues to be the principle of social security legislation a society static in social and economic arrangements will be produced. To assure a continuance of a system of private initiative a series of dynamic social controls which will maintain a flexible economy are needed. The author explains how these controls must be used. The hard choice that must be made, the sacrifices that must be borne to secure future advantages, and the price that must be paid for the things the American people want are clearly stated.

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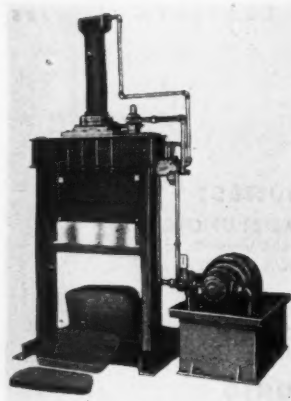


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NEW PUBLICATIONS

"Banbury Mixers." Bulletin No. 180, Farrel-Birmingham Co., Inc., Ansonia, Conn. 32 pages. Many applications of Banbury mixers in the rubber, plastics, asphalt, paint, and other industries are discussed in this bulletin containing illustrations of various sizes and types of the machines. Features of design and construction are described, and a table of sizes, capacities, dimensions, etc., is included. Specific information on installation and operation is given. There are a number of drawings showing typical arrangements of Banbury mixers with auxiliary equipment.

"Neoprene Type CG Adhesive Cements." BL-164, Supplement to BL-112. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. 24 pages. This report gives the results of tests to ascertain the effect of several accelerators on compounded Neoprene Type CG cements. Friction and shear (including dead weight) adhesions were determined on neoprene calender-coated fabric by methods described in the report. Accelerator 833 alone or mixtures of it and litharge were found to give rapid cures and are generally recommended. Results are also given for compounds accelerated by potassium hydroxide, di-propylene triamine, Accelerator 808, catechol, and Permalux. The properties of these cements in relation to usage requirements are briefly, but clearly discussed, including their effects on cotton and rayon fabrics.

"Ty-Ply, A Non-Tacky Adhesive for Bonding Natural and Synthetic Rubbers to Metal during Vulcanization." Booklet No. 5B, R. T. Vanderbilt Co., Inc., 230 Park Ave., New York, N. Y. July, 1944. 12 pages. Correct methods for handling and using the four brands of Ty-Ply are given in this laboratory report together with comparative summaries of adhesion, stress, tensile, elongation, and hardness data for each of seven compounds bonded to steel with a suitable grade of Ty-Ply. The results suggest that Ty-Ply QA and Ty-Ply SA are satisfactory substitutes for Ty-Ply Q and Ty-Ply S, which are under WPB allocation. A "Table of Adhesion to Various Metals with Ty-Ply" shows results obtained in bonding natural rubber and four types of synthetics to 16 different metals. In general, adhesion of GR-I with all metals is "poor." "Poor" results were also obtained for natural rubber and GR-S bonded to lead, tin plate, and Dowmetal.

"Velon and Foamex by Firestone." Firestone Industrial Products Co., Akron, O. 20 pages. Brightly colored illustrations suggest the many uses for product engineers and others of the Velon line of plastics available in fabrics, screens, braids and films, and of Foamex, an aerated synthetic rubber latex cushioning material.

"A Quarter Century with Skelly." Skelly Oil Co., Skelly Bldg., Kansas City, Mo. 8 pages. The Skelly Oil Co. was founded October 2, 1919. This booklet commemorates this founding and reviews the geological, production, manufacturing, and marketing progress of the firm.

"Facts about Oroplast—Oroplast for GR-S Mechanical Rubber Goods." Advance Solvents & Chemical Corp., 245 Fifth Ave., New York, N. Y. 7 pages. This bulletin presents typical GR-S formulations for hose, CV wire insulation, fast curing shoe soles, soft GR-S, and GR-S reclaim compounds, illustrating the advantages of Oroplast as an extender. These stocks are said to be of smooth consistency, cool running, and easily handled on mills, tubers, or calenders. Physical properties of the cured stocks are given.

"Amines." Carbide & Carbon Chemicals Corp., 30 E. 42nd St., New York 17, N. Y. 24 pages. The names, formulae, physical and chemical properties, specifications, container and shipping data, applications, and uses of 25 amines useful in manufacturing rubber and other products are given in this booklet. A section of graphical data includes freezing and boiling points, viscosities, surface tension versus composition of aqueous solutions, neutralization, vapor pressure, and hygroscopicity curves, and other pertinent information.

"List of Available Publications of the Department of Commerce." Compiled and indexed by Thelma C. Ager and Franklin L. Thatcher. United States Government Printing Office, Washington, D. C. 1944. 202 pages. Available publications of the National Bureau of Standards, Bureau of Foreign and Domestic Commerce, Bureau of the Census, Civil Aeronautics Administration, and other bureaus of the Department of Commerce are included in this indexed list. Many scientific and economic studies of rubber and rubber products are catalogued.

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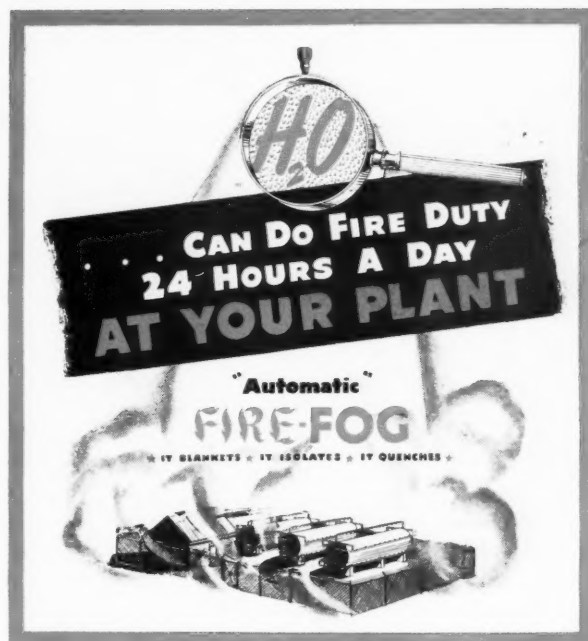
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World's Largest Petroleum Butadiene Plant. *Resinous Reporter*, Sept., 1944, pp. 2-4.



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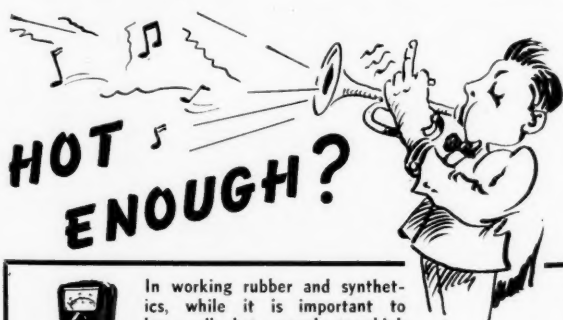
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Market Reviews

COTTON & FABRICS

NEW YORK COTTON EXCHANGE		CLOSING PRICES		WEEK-END	
	Aug.	Sept.	Oct.	Oct.	Oct.
Futures	26	30	7	14	21
Nov.	22.10	21.96	21.95	21.83	21.76
Dec.	21.46	22.08	21.89	21.83	21.73
Jan.	21.33	22.02	21.82	21.76	21.67
Mar.	21.25	22.13	21.87	21.80	21.73
July	20.70	21.97	21.51	21.54	21.49

THERE was a noticeable downward trend in cotton prices during October which offered traders little incentive to operate. Market activity was, for the most part, quiet and slow. The $\frac{1}{16}$ -inch spot middling price was 22.43¢ per pound October 5. It closed at 22.36¢ on October 16, at 22.16¢ on October 26, and at 22.07¢ on November 6.

The Commodity Credit Corp. announced October 5 an increase of 0.53¢ a pound in the cotton loan rate on the 1944 crop. The new rate is computed at 95% of parity, against the previous rate of 92½%. As applied to $\frac{1}{16}$ -inch middling, net weight, the new rate average is 21.93¢ a pound.

Maximum prices for storage and other warehousing services on government-owned cotton of the 1944-45 crop were increased by GMPR, Rev. Supp. Reg. 14, Am. 181, effective October 17. In general, the new ceilings represent a raise of 3¢ a bale.

Cotton consumed in September totaled

793,036 bales, the Bureau of the Census reported. August consumption was 841,490 bales, and that of September, 1943, 872,155 bales. Stored cotton September 30 amounted to 9,776,490 bales, compared with 10,433,070 bales a year ago.

A cotton crop of 11,953,000 bales this year was forecast by the Department of Agriculture. Last year's production was 11,483,000 bales. Favorable weather aided materially in maturing the current crop. The indicated acre yield is 284.6 pounds, against a 10-year average of 226.9 pounds.

Cotton sales yarn traders report little improvement in a generally tight supply situation. Civilian deliveries are not expected to increase for some time after cessation of the war in Europe.

Fabrics

In October demand from all quarters for all descriptions of gray goods continued far greater than available supplies. Most sales were against urgent military needs. Some industrial cotton goods were sold in restricted amounts on a monthly contract basis with highly rated orders frequently unfulfilled for lack of production or unwillingness to sell ahead. Price considerations were reported the paramount factor in the withheld attitude. Promised ceiling adjustments to reflect raw cotton parity were still awaited on osnaburgs and some other cloths. Raincoat manufacturers have had large demands for the past 60 days for civilian raincoats, but have been unable to

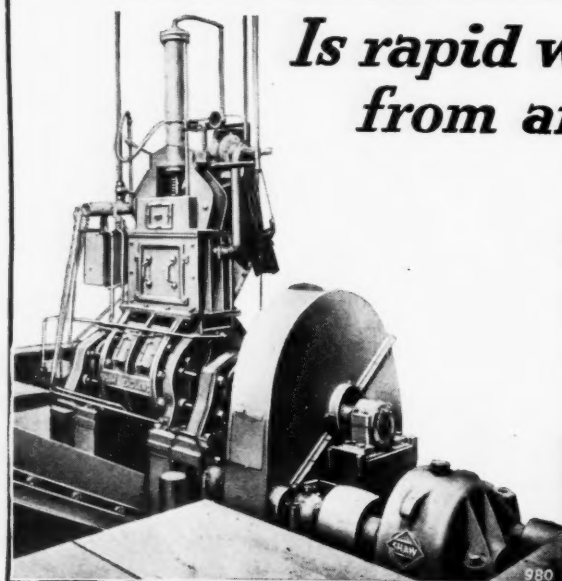
secure enough cloth to meet the volume of requests. Loom conversion to tent twills is reported to have decreased available fabrics for other urgencies such as life preservers.

Cotton textile production for 1944 is estimated at 9,000,000,000 yards, against total requirements of 12,000,000,000 yards. The potential decline offers no serious threat to the supply for the Armed Forces except for certain items, as duck. Impediments to current full production are said to be largely the result of a decline in number of textile employees and the workings of government administrative policy. Huge reserves of raw cotton and machinery to spin it into urgently needed goods are available.

Amendment 6 to MPR 167, effective October 3, permits producers of 1,100 denier high-tenacity rayon yarn, used in tire making, to apply to OPA for ceiling price adjustments.

SCRAP RUBBER

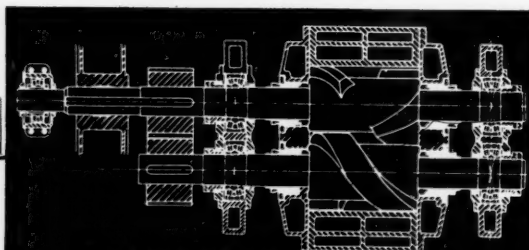
THE demand for scrap rubber in October was reportedly easier than in September. Tubes remained in short supply, but a slight increase was reported in available stocks as well as a slightly less heavy demand. The demand for carcass was said to be in excess of the supply. More recaps of synthetic camelback are appearing in scrap collections, and these constitute a source of difficulty to the trade. Supplies of natural scrap rubber are expected to



Is rapid wear inseparable from an Internal Mixer?

The answer given by the **SHAW INTERMIX** is a definite negative

There are sound engineering reasons for this and we shall be glad to supply full particulars.



The patented rotors of the Shaw Intermix are mounted on roller bearings.



The illustration above shows the discharge side of a K.4 Intermix. A full range of machines is manufactured from the laboratory sizes up to the K.7 size for handling 360 lb. batches (Sp. Gr. 1.3).

FRANCIS SHAW & CO. LTD. • MANCHESTER, II • ENGLAND

BEHIND THE MEN...

ON LAND

Pushing past Belgian cottages, this American armor division moves in on trapped German infantry near Gelin. Protected by Duck, necessary supplies go right along.



Signal Corps Photo



Signal Corps Photo

IN THE AIR

Aerial destroyers start on a mission in the New Hebrides. Planes and supplies are protected by Duck on the ground... Duck serves all branches of the service.



Wide World Photo

DUCK is doing a big job in this war on every front. And emergency uses are foreshadowing Duck's new developments for post-war industry. Because we supply so much of our Duck

to the armed forces, eight of the eleven Army-Navy "E" awards made to the mills we represent, were for "Excellence" in the production of Duck. Wellington Sears Company, 65 Worth Street, New York 13, N. Y.

WELLINGTON SEARS COMPANY, NEW YORK

drop in volume contingent upon the resumption of manufacture of civilian rubber goods.

In England stocks of rubber scrap on hand are said to be sufficient to cover all requirements for a considerable period.

Scrap Rubber Ceilings

Inner Tubes†	¢ per Lb.
Red passenger tubes.....	7½
Black passenger tubes.....	6¾
Truck tubes	6½

Tires‡	\$ per Short Ton
Mixed passenger tires	20.00
Beadless passenger tires	26.00
Mixed truck tires	20.00
Solid tires	36.00

Peelings†	
No. 1 peelings	52.25
No. 2 peelings	33.00
No. 1 light colored (zinc) carcass...	57.75

Miscellaneous Items‡	
Air brake hose	25.00
Miscellaneous hose	17.00
Rubber boots and shoes	33.00
Black mechanical scrap above 1.15 sp. gr.	20.00
General household and industrial scrap	15.00

† All consuming centers except Los Angeles.

‡ Akron only.

§ All consuming centers.

Faultless Rubber Co., Ashland, O.
Year ended June 30, 1944: net income, \$99,293, or \$1.52 a common share, against \$119,000, or \$1.82 a share, in the preceding fiscal year.

RECLAIMED RUBBER

DEMAND in October for practically all lines of reclaimed rubber was heavier than in the past summer months. In general, supplies are termed adequate, but the demand for red tube reclaim was greater than the supply. Activity was brisk in special types for the manufacture of non-mark soles. Substantial amounts of reclaimed rubber are still required for army goods. A good volume of business is expected between now and the end of the year. The ¼¢ a pound increase in reclaimed rubber prices granted by OPA is supposed to compensate for higher material and labor costs, but several manufacturers have indicated that the new price does not cover increased costs. OPA has agreed to make periodic investigations to determine the need for further price adjustments.

Reclaimed Rubber Prices

Auto Tire	Sp. Grav.	¢ per Lb.
Black select	1.16-1.18	6¾ / 7
Acid	1.18-1.22	7¾ / 8
Shoe		
Standard	1.56-1.60	7¼ / 7½
Tubes		
Black	1.14-1.26	11½ / 11¾
Gray	1.15-1.26	12¾ / 13½
Red	1.15-1.32	12¾ / 12¾
Miscellaneous		
Mechanical blends ..	1.25-1.50	4¾ / 5¾
White	1.35-1.50	13¾ / 14¾

The above list includes those items or classes only that determine the price bases of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

Rims Approved and Branded by The Tire & Rim Assn., Inc.

Rim Size	Sept. 1944
15" & 16" D. C. Passenger	1944
16x4.00E.....	108,129
16x4.25E.....	5,694
16x4.50E.....	9,690
15x5.00E.....	1,087
16x5.00E.....	16,696
16x5.00F.....	8,215
16x6.00F.....	13,970
15x6-L.....	6,614
16x6-L.....	361
16x6-L.....	766
Flat Base Truck	
20x4.33R (6").....	16,442
18x5.00S (7").....	484
18x5.00S (7").....	937
20x5.00S (7").....	436,192
15x6.00T (8").....	4,251
20x6.00T (8").....	44,014
22x6.00T (8").....	6,630
20x7.33V (9/10").....	39,959
22x7.33V (9/10").....	2,802
19x8.37V (11").....	126
20x8.37V (11").....	3,310
24x8.37V (11").....	2,314
Semi D.C. Truck	
16x4.50E.....	4,598
16x5.50F.....	5,037
Tractor & Implement	
15x3.00D.....	11,919
16x3.00D.....	2,404
18x3.25E.....	1,154
20x4.50E.....	676
18x5.50F.....	6,366
20x5.50F.....	1,488
24x8.00T.....	4,195
W8-24.....	320
W8-32.....	10,196
W9-28.....	2,359
W9-36.....	1,772
DW9-38.....	234
DW10-38.....	7,628
DW12-26.....	8,354
DW12-26.....	1,292
Total.....	798,675

TANNEY-COSTELLO CO.

DEALERS AND BROKERS

IN

SCRAP RUBBER

SYNTHETICS — PLASTICS

WE OFFER A SERVICE

BASED ON EXPERIENCE

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AKRON 9, OHIO

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INDIA RUBBER WORLD

Complete and in good condition

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INDIA RUBBER WORLD

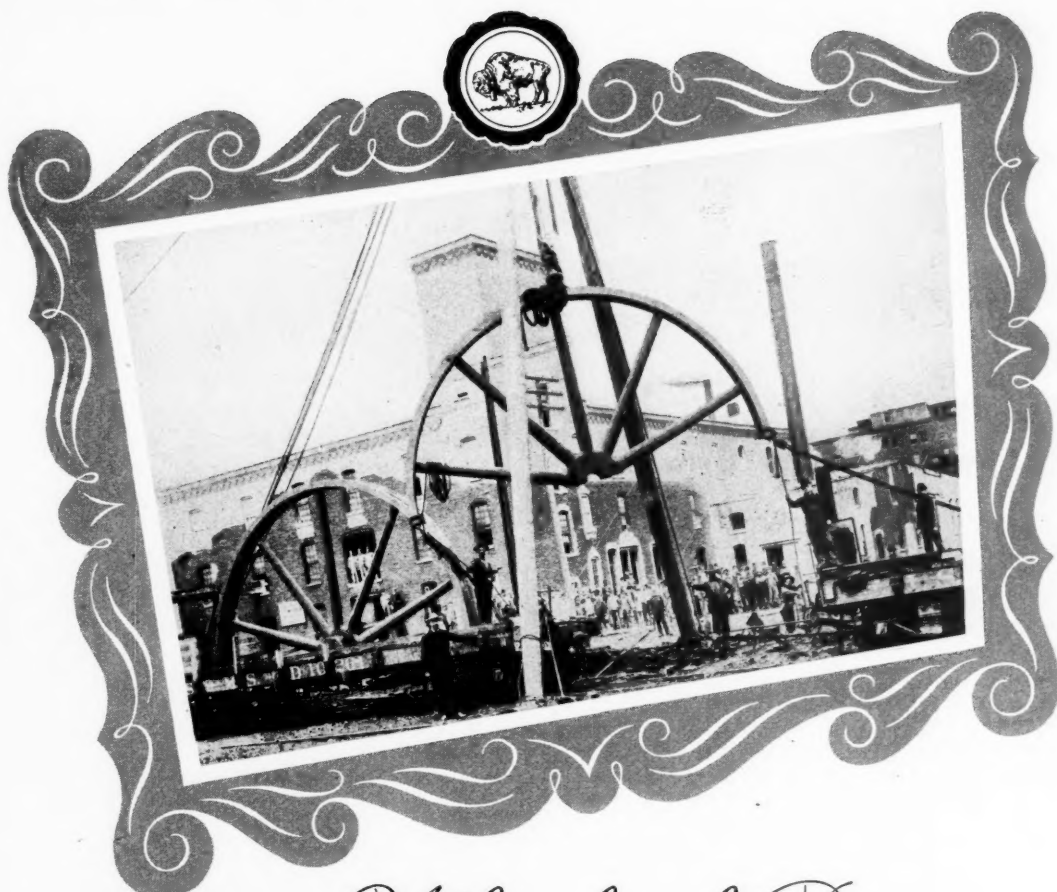
386 Fourth Avenue

New York 16, N. Y.

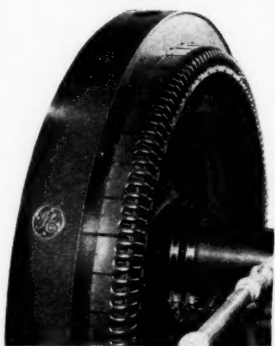


**FOR CUT AND CRACK GROWTH RESISTANCE
USE PHILBLACK A**

(FOR FURTHER DETAILS, SEE AD ON PAGE 130)



Wheels of Progress



IT WAS a proud day in 1902 when the manila rope-drive wheels, pictured above, were installed in Mill No. 1. Operated by a 1500 h.p.

induction motor, they ran two lines of refiners which produced 25,000 pounds of shoe stock a day. The inset photo shows a modern 600 h. p. synchronous motor driving modern refiners which daily turn out 25,000 pounds of highest quality, much lighter gravity reclaim.

From the days when our production went into carriage cloth, clincher tires, white and red tire

treads, etcetera, down to today's tremendously broadened use of reclaimed rubber—leading manufacturers of rubber products have relied on Buffalo's standardized brands for consistent quality in their own products.

Since 1883 U. S. Rubber Reclaiming Co., Inc. has served the industry solely as rubber reclaimers—selling its entire output for the exclusive use of its customers. This policy has always been an important asset to our customers—can be of even greater significance to a host of new users of reclaimed rubber whose inquiries will receive prompt and understanding attention.

U. S. RUBBER RECLAIMING COMPANY, INC.

500 FIFTH AVENUE • NEW YORK 18, N. Y. • (Plant at Buffalo, N. Y.)

AKRON...F. F. DUGAN, 907 Akron Savings & Loan Bldg. • TRENTON...H. M. ROYAL, Inc., 609 Pennington Ave. • TORONTO...H. VAN DER LINDE, Ltd., 156 Yonge St.

COMPOUNDING INGREDIENTS

Current Quotations*

Abrasives

Pumicestone, powdered.....lb.	\$0.035	/\$0.04
Rotenstone, domestic.....lb.	.025	/.03

Accelerators, Inorganic

Lime, hydrated, L.C.I., New York.....ton	25.00	
Litharge (commercial).....lb.	.085	/.09
Eagle, sublimed.....lb.	.085	/.09
Magnesia, calcined, extra light technical.....lb.	.25	
Heavy technical.....lb.	.05	/.1275
Light U. S. P.....lb.	.26	
Medium.....lb.	.12	
Magnesia, light, technical.....lb.	.25	

Accelerators, Organic

A-1.....lb.	.28	/.33
A-10.....lb.	.36	/.42
A-19.....lb.	.52	/.58
A-32.....lb.	.60	/.70
A-77.....lb.	.42	/.55
A-100.....lb.	.42	/.55
Accelerator No. 8.....lb.	.63	/.65
49.....lb.	.40	/.42
552.....lb.	1.63	
808.....lb.	.59	/.61
833.....lb.	1.13	/.115
Acrin.....lb.	.65	
Advan.....lb.	.55	
Altaz.....lb.	.39	/.41
Arazate.....lb.	1.53	
B-J-F.....lb.	.34	/.39
Beutene.....lb.	.59	/.64
Butasan.....lb.	1.10	
Butazate.....lb.	1.13	
Butyl Eight.....lb.	.97	/.99
C-P-B.....lb.	1.95	
Captax.....lb.	.34	/.36
Cumate.....lb.	1.60	
Cuprax.....lb.	.60	
D-B-A.....lb.	1.95	
Delac P.....lb.	.39	/.48
Di-Esterex-N.....lb.	.50	/.57
DOTG (Diorthotolylguanidine) lb.	.44	/.46
DPG (Diphenylguanidine).....lb.	.35	/.41
El-Sixty.....lb.	.36	/.43
Ethasan.....lb.	1.10	
Ethazate.....lb.	1.10	
Ethylene Aniline.....lb.	.42	/.43
Ethyl Unad.....lb.	1.25	
Formaniline.....lb.	.36	/.37
Guantal.....lb.	.39	/.48
Hepten.....lb.	.54	/.39
Base.....lb.	1.25	/.140
Lead Oleate Witco.....lb.	1.75	
Ledate.....lb.	1.20	
MBT.....lb.	.34	/.36
MBTS.....lb.	.39	/.41
Methasan.....lb.	1.20	
Methazate.....lb.	1.20	
Monex.....lb.	1.53	
Morlex "33".....lb.	.60	/.65
O-X-A-F.....lb.	.38	/.43
Pentex.....lb.	.74	/.84
Flour.....lb.	12.25	/.1325
Phenex.....lb.	.49	/.54
Pipazate.....lb.	1.53	
Pip-Pip.....lb.	1.63	
Polyac.....lb.	1.25	
R & H 50-D.....lb.	.42	/.43
R-2 Crystals.....lb.	1.55	
Rotax.....lb.	.44	/.46
Safex.....lb.	1.15	/.125
Santocure.....lb.	.60	/.67
Selenac.....lb.	1.60	
SPDX-G.....lb.	.53	/.58
SRA No. 2.....lb.	.53	/.55
Super-Sulphur No. 2.....lb.	.13	/.15
Tetrone.....lb.	1.25	
A.....lb.	1.85	
Thiofide.....lb.	.39	/.46
Thionex.....lb.	1.25	
Thiotax.....lb.	.34	/.41
Thiurad.....lb.	1.25	
Thiuram E.....lb.	1.25	
M.....lb.	1.25	
Trimene.....lb.	.54	/.64
Base.....lb.	1.03	/.118
Triphenylguanidine (TPG).....lb.	.45	
Tuads.....lb.	1.25	
Tuex.....lb.	1.25	
2-MT.....lb.	.58	/.60
Uto.....lb.	.99	/.104
Ureka.....lb.	.50	/.57
Blend B.....lb.	.50	/.57
C.....lb.	.48	/.55
Vulcanex.....lb.	.42	/.43
Z-B-X.....lb.	2.45	
Zenite.....lb.	.37	/.39
A.....lb.	.42	/.44
B.....lb.	.39	/.41

*Prices in general are f.o.b. works. Range indicates grade or quantity variations. Space limitation prevents listing of all known ingredients. Prices are not guaranteed, and those readers interested should contact suppliers for spot prices.

†Price quoted is f.o.b. works (bags). The price f.o.b. works (bulk) is \$0.033 per pound. All prices are carlot.

‡Because of difficulty in interpreting OPA ceilings, consumers should contact supply houses for prices.

Zimate, Butyl.....lb.	\$1.10	
Ethyl.....lb.	1.10	
Methyl.....lb.	1.20	

Activators

Activex.....lb.	.20	/\$0.22
Aero Ac 50.....lb.	.46	/.52
Barak.....lb.	.50	
MODX.....lb.	.295	/.345
SL-20.....lb.	.1089	/.1135

Age Resisters

AgeRite Alba.....lb.	1.95	/.2.05
Gel.....lb.	.52	/.54
Hipar.....lb.	.61	/.63
Powder.....lb.	.40	/.42
Resin.....lb.	.43	/.45
D.....lb.	.40	/.42
White.....lb.	1.23	/.1.33
Akroflex C.....lb.	.53	/.55
Albaan.....lb.	.69	/.74
Aminox.....lb.	.40	/.49
Antox.....lb.	.54	/.56
Betanox.....lb.	.43	/.52
B-L-E.....lb.	.40	/.49
Powder.....lb.	.61	/.70
B-X-A.....lb.	.43	/.52
Copper Inhibitor X-872-A.....lb.	1.15	
Flectal H.....lb.	.40	/.47
Neozone (standard).....lb.	.61	/.63
A.....lb.	.40	/.42
C.....lb.	.43	/.45
D.....lb.	.40	/.42
Distilled.....lb.	.45	/.47
E.....lb.	.61	/.63
Oxynone.....lb.	.77	/.90
Permalux.....lb.	1.18	1.20
Santoflex B.....lb.	.40	/.47
BX.....lb.	.54	/.61
Santovar-O.....lb.	1.15	1.40
Solux.....lb.	1.28	1.30
Stabilite.....lb.	.48	/.50
Alba.....lb.	.69	/.74
Thermoflex.....lb.	1.18	1.20
A.....lb.	.61	/.63
C.....lb.	.54	/.56
Tysonite.....lb.	.165	/.17
V-G-B.....lb.	.43	/.52

Alkalies

Caustic soda, flake, Columbia (400-lb. drums).....100 lbs.	2.50	
Liquid, 50%.....100 lbs.	1.75	
Solid (100-lb. drums).....100 lbs.	2.10	

Antiscorch Materials

Cumar RH.....lb.	.105	
E-S-E-N.....lb.	.34	/.39
R-17 Resin (drums).....lb.	1.075	
RM.....lb.	1.25	
Retarder W.....lb.	.36	
Retardex.....lb.	.445	/.475
U-T-B.....lb.	.34	/.39

Antiseptics

Compound G-4.....lb.	.95	1.40
G-11.....lb.	4.50	4.75

Antisun Materials

Heliozone.....lb.	.23	/.24
S.C.R.....lb.	.32	/.34
Sunproof.....lb.	.2275	/.2775

Blowing Agents

Unicel.....lb.	.50	
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Brake Lining Saturant

B.R.T. No. 3.....lb.	.0175	/.0185
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Carbon Black

Conductive Channel—CC

Conductex A.....lb.	.05	/.085
Huber 35-C.....lb.	.075	
Spheron C.....lb.	.0455	
I.....lb.	.0405	
N.....lb.	.15	
Witco R10.....lb.	.0455	
R40.....lb.	.105	/.14
Voltex.....lb.	.105	/.14

Hard Processing Channel—HPC

Continental F.....lb.	.0355†	
Huber HX.....lb.	.0355†	
Kosmobile S/Dixiedens S.....lb.	.0355†	
Micronex Mark II.....lb.	.0355†	/.075
Spheron #4.....lb.	.0355†	
Witco 6.....lb.	.0355†	

Medium Processing Channel—MPC

Arrow.....lb.	.0355†	
Continental A.....lb.	.0355†	
Huber TX.....lb.	.0355†	
Kosmobile 66/Dixiedens 66.....lb.	.0355†	
Spheron #6.....lb.	.0355†	
Standard Micronex.....lb.	.0355†	/.075
Witco 1.....lb.	.0355†	

Easy Processing Channel—EPC

Continental AA.....lb.	.0355†	
Kosmobile 77/Dixiedens 77.....lb.	.0355†	
Micronex W-6.....lb.	.0355†	
Spheron #9.....lb.	.0355†	
Witco 12.....lb.	.0355†	
Wyex.....lb.	.0355†	

Conductive Furnace—CF

Statex A.....lb.	.08	/.10
Sterling I.....lb.	.09	

Fine Furnace—FF

Statex B.....lb.	\$0.07	/\$0.09
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High Modulus Furnace—HMF

Kosmos 40/Dixie 40.....lb.	.05	/.075
Modulux.....lb.	.05	
Philblack A.....lb.	.05	/.06
Statex 93.....lb.	.05	/.075
Sterling L.....lb.	.05	

Semi-Reinforcing Furnace—SRF

Continex.....lb.	.035	/.055
Furnex.....lb.	.035	/.06
Gastex.....lb.	.035	/.06
Kosmos 20/Dixie 20.....lb.	.035†	
Sterling.....lb.	.035†	
Witco.....lb.	.035	/.055

Fine Thermal—FT

P-33.....lb.	.04	
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Medium Thermal

Thermax.....lb.	.0225	
Velvetex.....lb.		

Colors

Black

Lampblack (commercial), L.C.I.....lb.	.12	/.14
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Blue

Du Pont Powders.....lb.	2.25	3.75
Toners.....lb.	.30	3.50

Brown

Mapico.....lb.	.1135	
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Green

Chrome.....lb.	.25	
Oxide (freight allowed).....lb.	.25	
Chromium Hydroxide.....lb.	.70	
Guignet's (bbbs.).....lb.	.70	
Toners.....lb.	.35	4.00

Orange

Du Pont Powders.....lb.	2.75	3.05
Toners.....lb.	.30	1.50

Orchid

Pink

Purple

Red

Antimony.....lb.	.48	
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Crimson, 15/17%.....lb.	.48	
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R.M.P. No. 3.....lb.	.52	
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Sulphur free.....lb.	.37	
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7-A.....lb.	.25	
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2-Z.....lb.	.48	1.65
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Du Pont Powders.....lb.	.07	.15
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Iron Oxide, L.C.I.....lb.	.0885	.096
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Mapico.....lb.	.0885	.096
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Rub-Ex-Red (bbbs.).....lb.	.0975	
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Toners.....lb.	.25	4.15
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White

Lithopone (bags).....lb.	.0425	.045
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Albalith.....lb.	.0425	.045
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Eagle.....lb.	.0725	.0734
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Titanium Pigments.....lb.	.145	.155
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Rayox.....lb.	.145	.155
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Titanox-A LO and MO.....lb.	.053	.0575
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C.....lb.	.0725	.075
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Ti-Tone.....lb.	.0725	.075
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Zopaque (50-lb. bags).....lb.	.145	
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Zinc Oxide.....lb.	.0725	.075
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Azo ZZZ-11.....lb.	.0725	.075
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44.....lb.	.0725	.075
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55.....lb.	.0725	.075
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66.....lb.	.095	.0975
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Eagle, lead free.....lb.	.0725	.0750
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French Process, Florence.....lb.	.09	.0925
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Green Seal-8.....lb.	.085	.0875
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Red Seal-9.....lb.	.095	.0975
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White Seal-7.....lb.	.095	.0975
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Kadox, Black Label-15.....lb.	.0725	.075
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No. 25.....lb.	.085	.0875
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72.....lb.	.0725	.075
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Red Label-17.....lb.	.0725	.075
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Horse Head XX Special 3.....lb.	.0725	.075
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XX Red-4.....lb.	.0725	.075
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78.....lb.	.0725	.075
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156.....lb.	.0725	.075
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166.....lb.	.0725	.075
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St. Joe (lead free).....lb.	.0725	.075
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Black Label.....lb.	.0725	.075
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Green Label.....lb.	.0725	.075
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Red Label.....lb.	.0725	.075
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U.S.P. No. 12.....lb.	.105	.1075
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Zinc Sulphide Pigments.....lb.	.0825	.085
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Cryptone ZS No. 800.....lb.	.0825	.085
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Tomorrow
NEVER COMES
BUT PROGRESS MARCHES ON!

Forward-

with

EMULSIONS
S. S. S. S. S.

RESIN

New methods of monomer polymerization at ARCC give you today new resins, and the coordination of these in progressive compounding of synthetic latices.

Also coatings, impregnants, laminants; complete adhesives and formulations for compounding industrial adhesives.

Acrylic, Vinyl, Maleic, Phenolic, Styrene, Alkyd, Hydrocarbon, Cellulose Derivatives.

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AMERICAN RESINOUS CHEMICALS CORP.

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Newark, N. J.

Chicago, Ill.

Monrovia, Calif.



RUBBER
★
SYNTHETIC RUBBER
★
PLASTICS

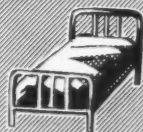
THE
Schuster
MAGNETIC CALENDER GAUGE
SAVES THAT MATERIAL

For upwards of 15 years, the Schuster Magnetic Calender Gauge has unerringly set rubber calender rolls to a predetermined thickness and correctly maintained that thickness. It has saved the time of hand-miking, eliminated human error, saved the stock sampled for calender tests, and assured uniform thickness in the finished product.

All this, *at the right time*—before damage is done. And *continuously*—the only way worth while.

The instrument is simple in design . . . rugged in construction . . . practically without wearing parts . . . adjustable to any thickness. Originally used for rubber, it has taken over just as deftly for synthetic rubber, plastics, cellulose, and other media. No matter what the article, your coating must be thick enough, but not even 1/1000" too thick, or the war effort suffers irreparable loss. No matter what the material, you've got to s-t-r-e-t-c-h it as far as possible—and "possible" daily proves to have a new, elastic meaning.

Better investigate the Schuster Magnetic Calender Gauge at once, with or without automatic control. Every installation has to be engineered to the job . . . Please give us time to do it right.



Ask for our bulletin on the Schuster Magnetic Gauge.

THE MAGNETIC GAUGE COMPANY
60 EAST BARTGES STREET AKRON, OHIO

Eastern States Representative—
BLACK ROCK MANUFACTURING CO., Bridgeport, Conn.

Fillers, Inert

Asbestos Fiber.....	ton \$15.50	/ \$48.00
Barytes.....	ton 25.55	/ 40.00
Off color, domestic.....	ton 29.00	
White, domestic.....	ton 38.50	/ 40.00
Blanc fixe, dry, precip.....	ton 80.00	
Calcene T.....	ton 37.50	/ 45.00
Kalite No. 1.....	ton 26.00	
Kalvan.....	ton 100.00	
Magnesium carbonate i.c.h.....	lb. .0625	/ .075
Pyrax A.....	ton 7.90	
Whiting.....		
Suprex White (precipitated calcium carbonate).....	ton 32.50	
Witco, c.i.....	ton 32.50	
Witcarb.....	ton 50.00	

Finishes

Mica, i.c.h.....	lb. .045	/ .055
Rubber lacquer, clear.....	gal. 1.00	/ 2.00
Colored.....	gal. 2.00	/ 3.50
Shoe varnish.....	gal. 1.45	
Talc.....	ton 25.00	/ 35.00

Flock

Cotton flock, dark.....	lb. .095	/ .112
Dyed.....	lb. .45	/ .85
White.....	lb. .12	/ .20
Fabril X-24 G.....	lb. .095	
X-24 W.....	lb. .135	
Filfloc 6000.....	lb. .16	
F-40-9000.....	lb. .105	
Rayon flock, colored.....	lb. 1.00	/ 1.50
White.....	lb. .75	/ 1.25

Latex Compounding Ingredients

Accelerator 89.....	lb. 1.20	
Advawet.....	lb. .46	
Aeromol (drams).....	lb. .35	
Antox, dispersed.....	lb. .54	
Aqualex B.B.X. Conc.....	lb. .70	
Arenkap No. 50.....	lb. 18	/ .24
100, dry.....	lb. .39	/ .51
Aresket No. 240.....	lb. .16	/ .22
300, dry.....	lb. .42	/ .50
Aresklene No. 375.....	lb. .35	/ .50
400, dry.....	lb. .51	/ .65
Black No. 25, dispersed.....	lb. .22	/ .40
Casein.....	lb. .24	/ 24.75
Collochar (Dispersed Wyex).....	lb. .06	/ .07
Copper Inhibitor X-872.....	lb. 2.25	
Darvan No. 1.....	lb. .30	/ .34
2.....	lb. .30	/ .34
Dispersex No. 15.....	lb. .11	/ .12
20.....	lb. .08	/ .10
Factex Dispersion A.....	lb. .185	
Micronex, Colloidal.....	lb. .06	/ .07
Nevilloid C-55.....	lb. .12	
Resin V.....	lb. .41	/ .65
Santomer D.....	lb. .11	/ .25
Sodium Stearate.....	lb. .40	
Stablex A.....	lb. .90	/ 1.10
B.....	lb. .70	/ .90
C.....	lb. .40	/ .50
Sulphur, dispersed No. 2.....	lb. .08	/ .12
Tepidone.....	lb. .63	
Typonite, dispersed.....	lb. .32	/ .35
Zinc oxide, dispersed.....	lb. .12	/ .15

Mineral Rubber

Black Diamond, i.c.h.....	ton 25.00	/ 30.00
B.R.C. No. 20.....	lb. .0105	/ .0115
Hydrocarbon, Hard.....	ton 25.00	/ 27.00
Lode.....	lb. .04	/ .045
Millimar.....	lb. .055	
Parmr.....	ton 21.00	/ 29.00
Pioneer, c.i.....	lb. 25.00	/ 30.00
Witco MR solid.....	ton 25.00	
Granular.....	ton 30.00	

Mold Lubricants

Aluminum Stearate.....	lb. .23	/ .24
Aqualex D.....	lb. .60	
MDL Paste.....	lb. .25	
Colite.....	gal. .90	/ 1.15
Dipex.....	lb. .1275	/ .15
Lubrex.....	lb. .25	/ .30
Rubber-Glo, conc. regular.....	gal. .94	/ 1.15
Type W.....	gal. .99	/ 1.20
Sericate.....	ton 65.00	
Soapstone, i.c.h.....	ton 15.00	/ 35.00
Zinc Stearate.....	lb. .30	/ .31

Oil Resistant

A-X-F.....	lb. .82	/ .85
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Reclaiming Oils

B.R.V.....	lb. .03	/ .0375
C-10.....	lb. .19	/ .24
D-4.....	gal. .17	/ .22
E-5.....	gal. .15	/ .20
No. 1621.....	lb. .016	/ .0235
S.R.O.....	lb. .015	/ .0225
X-60 (reclaiming).....	gal. .20	/ .28
X-443.....	gal. .20	/ .27

Reinforcers, Other Than Carbon Black

Alumina, Hydrated		
Alorco C-740.....	lb. .0375	/ .065
C-741.....	lb. .0375	/ .065
Buca.....	ton 40.00	
Carboxen Flakes.....	lb. .03	/ .035
S.....	lb. .031	/ .036
Plastic.....	lb. .031	/ .0335

Clays

Aerfloted Hi-White.....	ton \$10.00	
Paragon.....	ton 10.00	
Suprex.....	ton 11.00	/ \$23.50
Catalpo, c.i.....	ton 30.00	
Champion.....	ton 11.00	/ 23.50
China.....	ton 25.00	
Dixie.....	ton 11.00	
Hydratex R.....	ton 20.00	
"L".....	ton 10.00	
Langford.....	ton 9.50	/ 20.00
Magnolia.....	ton 10.00	
McNamee.....	ton 10.00	
#33.....	ton 30.00	
Par.....	ton 11.00	
Paraforce, c.i.....	ton 50.00	
Witco, c.i.....	ton 25.00	
Cumar EX.....	lb. .0525	
MH.....	lb. .065	/ 0.1175
V.....	lb. .0975	/ .1275
465 Resin.....	lb. .035	
"C" Resin.....	lb. .08	
Nevindene.....	lb. .105	/ .135
Resinex.....	lb. .0275	/ .0325
Silene "EF".....	lb. .055	/ .06
Silical.....	ton 65.00	/ 85.00

Reodorants

Amora (ABCD).....	lb. 2.75	/ 3.25
Coumarin.....	lb. 4.75	
Curodex 19.....	lb. 5.75	
188.....	lb. 6.75	
198.....	lb. .25	/ 4.00
Para-Dors (ABCDE).....	lb. 4.00	/ 4.50
Rodo No. 0.....	lb. 5.00	/ 5.50
10.....	lb. 2.35	/ 2.95
Vanillin.....	lb. 2.35	/ 2.95

Rubber Substitutes

Black.....	lb. .09	/ .15
Brown.....	lb. .105	/ .1875
White.....	lb. .0975	/ .165
Factice.....		
Amberex Type B.....	lb. .20	
Brown.....	lb. .095	/ .19
Neophax A.....	lb. .165	
B.....	lb. .165	
White.....	lb. .10	/ .20

Softeners and Plasticizers

Abalyn.....	lb. .0722	/ .0947
Amidex.....	lb. .23	
"S".....	lb. .23	
B.R.T. No. 7.....	lb. .02	/ .021
Belro Resin.....	100 lb. 2.71	/ 3.00
Bondogen.....	lb. .98	/ 1.05
Bunnatol (for synthetic rubber).....	lb. .40	/ .50
C.....	lb. .40	/ .50
Butac.....	lb. .085	/ .105
Butyl Sebate.....	lb. .16	/ .195
Capryl Alcohol.....	lb. .16	/ .195
Circosol-2XH Elasticator for.....	gal. .67	/ .74
Dibenzyl Sebate.....	lb. .51	/ .59
Phthalate.....	lb. .46	/ .565
Dibutyl Sebate.....	lb. .25	/ .30
Dicapryl Phthalate.....	lb. .56	/ .58
Dipentene.....	gal. .33	/ .38
Dipolymer Oil.....	lb. .0375	/ .04
Dispersing Oil No. 10.....	lb. .25	/ .295
Duraplex C-50 LV, 100%.....	lb. .065	/ .20
Galex.....	lb. .1122	/ .1347
Hercolyn.....	lb. .65	/ .67
Marbon S.....	lb. .80	/ 1.00
S-1.....	lb. .80	/ 1.00
Myriatylene.....	lb. .13	/ .30
Nevinol.....	lb. .04	
No. 1-D Heavy Oil.....	lb. .60	
16 Resin.....	lb. .029	
Nuba resinous pitch (drams).....	lb. .0425	
Grades No. 1 and No. 2.....	lb. .15	
3-X.....	lb. .17	/ .18
Palmalene.....	gal. .135	/ .19
Para Flux (reg.).....	gal. .046	/ .048
No. 2016.....	lb. .0525	
Para Lube.....	lb. .0525	
Paradene No. 1 (drams).....	lb. .0525	
No. 2.....	lb. .0525	
Special (drams).....		
20 to 35° C. M.P.....	lb. .0625	
35 to 45° C. M.P.....	lb. .0625	
45 to 75° C. M.P.....	lb. .0575	
Paraplex AL-111.....	lb. .21	/ .25
G-25, 100%.....	lb. .75	
Phthalate.....	lb. .51	/ .59
Parolls.....	lb. .0975	/ .18
Picco-100.....	lb. .09	
Piccocizer "30".....	lb. .055	/ .06
Piccolyte Resins.....	lb. .15	/ .185
Piccoumaron Resins.....	lb. .045	/ .15
Pictar.....	gal. .18	/ .23
Oil.....	gal. .45	
Plasticizer B.....	lb. .35	/ .45
35.....	lb. .205	/ .24
36.....	lb. .305	/ .34
Plastoflex No. 10.....	lb. .20	
No. 20.....	lb. .25	
Plastogen.....	lb. .0775	/ .08
Plastone.....	lb. .27	/ .30
Poly-pale Resin.....	lb. .06	/ .07
R-19 Resin (drams).....	lb. .1075	
21 Resin (drams).....	lb. .1075	
Reogen.....	lb. .15	/ .12
Resin R-6-3.....	lb. .38	/ .40
Rio Resin.....	lb. .36	/ .38

RPA No. 1E.....	lb. \$ 0.55	
2.....	lb. .65	
3.....	lb. .46	
4.....	lb. .80	
5.....	lb. .57	
Santicizer B-16.....	lb. .32	/ \$0.36
E-15.....	lb. .34	/ .38
M-17.....	lb. .355	/ .39
Sebacic Acid.....	lb. .48	/ .55
Solvenol.....	gal. .56	/ .58
Stybelite.....	lb. .06	/ .065
Syntac.....	lb. .275	/ .35
Tarzac.....	lb. .23	/ .24
TP-10.....	gal. .55	/ .75
90-B.....	gal. .55	/ .65
TR-11.....	lb. .035	
Tricresyl Phosphate.....	lb. .24	/ .245
Turgum "S".....	lb. .0675	
Vinsol Resin.....	lb. .025	/ .035
Vistac No. 1.....	lb. 0.20	/ 0.214
No. 2.....	lb. .214	/ .227
Witco No. 20, i.c.h.....	gal. .175	
X-1 resinous oil (tank car).....	lb. .011	/ .016
XX-100 Resin.....	lb. .0525	

Softeners for Hard Rubber Compounding

Resin C Pitch 45° C. M.P.....	lb. .01	/ .016
60° C. M.P.....	lb. .01	/ .016
75° C. M.P.....	lb. .01	/ .016

Solvents

Carbon Bisulphide.....	100 lbs. 5.00	/ 5.75+
Tetrachloride.....	gal. .73	/ .94+
Cosol No. 1.....	gal. .26	/ .34
No. 2.....	gal. .25	/ .23
No. 3.....	gal. .22	/ .30
Industrial 90% benzol (tank car).....	gal. .15	/ .22
Nevsol.....	gal. .245	/ .31
Picco.....	gal. .22	/ .32
Skellysolve.....	gal. .071	/ .105
Tollac.....	gal. .28	/ .33

Stabilizers for Cure

Barium Stearate.....	lb. .29	/ .32
Calcium Stearate.....	lb. .26	/ .27
Laurex (bags).....	lb. .1475	/ .1725
Magnesium Stearate.....	lb. .31	/ .32
Stearax, single pressed.....	lb. .1475	/ .1575
double pressed.....	lb. .1575	/ .1675
Beads.....	lb. .1475	/ .1575
Stearic acid, single pressed.....	lb. .1475	
Stearite, c.i.....	lb. .29	/ .32
Zinc Laurate.....	lb. .30	/ .31
Stearate.....	lb. .30	/ .31

Synthetic Rubber

Chemigum N-1.....	lb. .53	/ .60
Hycar OR-15.....	lb. .50	/ .65
OR-25.....	lb. .45	/ .60
OS-10.....	lb. .45	/ .60
Neoprene Latex Type dry weight.....		
60.....	lb. .43	/ .44
571.....	lb. .36	/ .40
Concentrated.....	lb. .41	/ .42
572.....	lb. .45	/ .46
Neoprene Type CG.....	lb. .50	
E.....	lb. .65	
FR-S.....	lb. .65	
GN-A.....	lb. .28	
KNR.....	lb. .75	
Paraplex X-100.....	lb. 1.00	
Perbunan 26.....	lb. .48	
Synthetic 100.....	lb. .41	
"Thiokol" Type "A".....	lb. .45	
"FA".....	lb. .60	
ST.....	lb. .66	/ .76
LP-2.....	lb. .85	
Water Dispersions ("Thiokol" Latex) dry weight.....		
MF.....	lb. .70	/ .80
MX-3112.....	lb. .65	/ .75
WD-2.....	lb. .75	/ .85
3.....	lb. .75	/ .85

Tackifiers

B.R.H. No. 2.....	lb. .015	
Plastac.....	lb. .12	
TY-PLY Q.....	gal. 6.75	/ 8.00
A.....	gal. 6.75	/ 8.00
S.....	gal. 6.75	/ 8.00
A.....	gal. 6.75	/ 8.00

Vulcanizing Ingredients

Magnesia, light (for neoprene).....	lb. .25	
Sulphur.....	100 lbs. 2.05	
Insoluble, 60.....	lb. .16	
Rubbermaker's com-mercial.....	100 lbs. 2.05	
Refined.....	100 lbs. 2.40+	
Telloy.....	lb. 1.75	
Tonox.....	lb. .50	/ .59
Vandex.....	lb. 1.75	
Ultac 1.....	lb. .15	
2.....	lb. .15	
3.....	lb. .15	

(See also Colors—Antimony)

Waxes

Antisol.....	lb. .225	/ .275
Carnauba, No. 3 chalky.....	lb. .7125	
2 N.C.....	lb. .7675	
3 N.C.....	lb. .735	/ .745
1 Yellow.....	lb. .8325	
2.....	lb. .8125	
Carnube.....	lb. .49	/ .59
Monten.....	lb. .12	/ .17
Rubber Wax No. 118.....	gal. .76	/ 1.31
Neutral.....	gal. .86	/ 1.41
Colors.....	gal. .86	/ 1.41

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SPREADING ROOM FOREMAN

with experience in general proofing.

Suburban Boston Area. Permanent postwar position. Must be able to furnish Certificate of Availability.

ADDRESS BOX NO. 910, Care of INDIA RUBBER WORLD.

WANTED: CHEMIST, EXPERIENCED IN ALL phases of compounding molded rubber goods. Knowledge of synthetic and plastic compounding preferred, but not necessary. Eastern concern. Excellent opportunity. Address Box No. 944, care of INDIA RUBBER WORLD.

TIRE CURING FOREMAN—Capable of supervising production in pot heaters and individual vulcanizers. Excellent opportunity for good postwar position. Location away from Ohio. Address Box No. 945, care of INDIA RUBBER WORLD.

TIRE FINISHING SUPERVISOR—Familiar with all duties connected with cured-tire final finishing department. Good opening in progressive organization. Location in Pennsylvania. Address Box No. 946, care of INDIA RUBBER WORLD.

TUBE ROOM SUPERINTENDENT—Must be thoroughly familiar with tube room operations. Salary commensurate with ability. All replies treated in strictest confidence. Address Box No. 947, care of INDIA RUBBER WORLD.

WANTED: CHEMIST, OR CHEMICAL ENGINEER, experienced in the development and quality control of packings and gaskets. Address Box No. 948, care of INDIA RUBBER WORLD.

CHEMICAL ENGINEER—COLLEGE GRADUATE PREFERRED—for position in Compounding Section of progressive manufacturer, producing tires and tubes. Previous experience desirable, but not required. Plant located in Mid-Atlantic area. Complete history of qualifications should be included in letter of application. Address Box No. 949, care of INDIA RUBBER WORLD.

TIRE AND TUBE DEVELOPMENT AND CONSTRUCTION engineers, excellent opportunity in a medium-sized organization. Salary commensurate with ability. Plant located in Pennsylvania. Address Box No. 950, care of INDIA RUBBER WORLD.

WANTED: A TECHNICALLY TRAINED MAN with good background in Mixing, Calendering, and Tubing, to work in the newly created Technical Department of a plant producing mechanical rubber goods. Factory located in Western New York State. Good postwar future. Address Box No. 964, care of INDIA RUBBER WORLD.

SITUATIONS OPEN (Continued)

Mechanical Engineer Wanted

Mechanical Engineer thoroughly experienced in the designing and operation of mills, calenders, etc., for the rubber and plastic industry. Must have technical training and good references. Will be required to do layout work and develop new equipment. The plant needing the services of this engineer is long established and a recognized leader in the manufacture of rubber and plastic working machinery. The position is permanent and offers exceptional post-war opportunities to the right man. Address Box No. 963, care of INDIA RUBBER WORLD.

CHEMIST — WITH BACKGROUND ON TIRES, tubes, or mechanical goods. This opening has real possibilities both in regard to salary and continuity of employment. Address Box No. 951, care of INDIA RUBBER WORLD.

THOROUGHLY CAPABLE MAN EXPERIENCED in modern methods of operating Tubing Machine Department, Mechanical Rubber Goods plant. Reply in detail giving names of companies where experience obtained, length of service, age, salary, etc. Address Box No. 955, care of INDIA RUBBER WORLD.

SUPERINTENDENT: FOR SMALL RUBBER PLANT MANUFACTURING soft mechanicals, including rubber thread. Must be familiar with production, milling, compounding, etc., but specific experience in thread manufacture not essential. Plant is located in Southern New England. State age, education, experience, and salary expected. Address Box No. 957, care of INDIA RUBBER WORLD.

SUPERINTENDENT FOR RUBBER PLANT IN northern Ohio employing 150 people. Must have general experience with mechanical rubber products. Position offers excellent opportunity for the right man. Address Box No. 962, care of INDIA RUBBER WORLD.

ARE YOU CALLING ON RUBBER AND PLASTIC MOLDERS? If so, increase your income selling them a steam fitting all of them use. Address Box No. 967, care of INDIA RUBBER WORLD.

CHEMIST OR CHEMICAL ENGINEER—EXPERIENCED IN THE development and manufacture of adhesives and cements desired by progressive midwest rubber company. Please state education, experience, and salary requirements in reply. Address Box No. 974, care of INDIA RUBBER WORLD.

CHEMIST WANTED—EXPERIENCED IN COATING CLOTH AND paper with rubber, synthetic rubber, lacquer, and resins in the manufacture of imitation leather and adhesive tape. Actual experience in the field absolutely necessary. Excellent salary and possibilities of advancement. Location near Boston, Mass. Address Box No. 975, care of INDIA RUBBER WORLD.

FOSTER D. SNELL, INC.

Our staff of chemists, engineers and bacteriologists with laboratories for analysis, research, physical testing and bacteriology are prepared to render you

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QUALITY MOULDS FOR ALL PURPOSES

South Easton, Mass.

THE FIRST STEP — A QUALITY MOULD

(Classified Advertisements Continued on Page 240)



Porcelain Glove Forms

—for dipped rubber gloves, including linemen's or electricians' gloves and surgeons' gloves. Some are made from our own stock molds and others from customers' molds.

Write today for our new catalog covering rubber glove and other forms for dipped rubber goods. Prompt attention given to requests for quotations based on your specifications or stock items.

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COLORS for RUBBER

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BROOKLYN COLOR WORKS, Inc.
Morgan and Norman Aves. Brooklyn 22, N. Y.

Classified Advertisements

Continued

SITUATIONS WANTED

RUBBER CHEMIST, 20 YEARS' EXPERIENCE IN COMPOUNDING, testing, research, and control of rubber and chemicals. Seeks responsible position with postwar prospects. Address Box No. 952, care of INDIA RUBBER WORLD.

FACTORY REPRESENTATIVE, COVERING PHILADELPHIA and adjacent territory, seeks connection with manufacturer of extruded rubber sections. Also manufacturer of sponge rubber products. These lines desired in connection with a line of molded rubber products and lathe cut washers for which he is now factory representative. Address Box No. 954, care of INDIA RUBBER WORLD.

POSITION WANTED. PURCHASING AGENT WITH EXPERIENCE in rubber and chemical industries desires to make a change. Familiar with industry and markets. Exempt from draft, young, in good health. Address Box No. 961, care of INDIA RUBBER WORLD.

TECHNICAL SUPERINTENDENT WITH 25 YEARS in manufacturing mechanicals from natural and synthetic rubbers in various-size plants. Thorough background as development engineer and compounder. Can estimate costs and provide specifications. Address Box No. 965, care of INDIA RUBBER WORLD.

RUBBER ENGINEER, EXECUTIVE TYPE, AVAILABLE December 1st. Broad experience in large and small plants as development engineer, compounder of natural, reclaimed, and synthetic rubber for mechanicals, estimating costs and compiling manufacturing specifications. Address Box No. 966, care of INDIA RUBBER WORLD.

BUSINESS OPPORTUNITIES

RUBBER TECHNOLOGIST OF MORE THAN 25 years' experience has developed method of reclaiming synthetic rubber articles. Simple process and low cost. Wishes to contact interested parties. Address Box No. 953, care of INDIA RUBBER WORLD.

WANTED TO PURCHASE: SMALL RUBBER plant well equipped making molded, extruded, and coated products. Give full details. Cash available. Address Box No. 968, care of INDIA RUBBER WORLD.

WANT TO INVEST \$25,000 OR MORE IN GOING rubber company or will purchase same at reasonable figure. Address Box No. 969, care of INDIA RUBBER WORLD.

PLANT FOR SALE: ONE COMPLETE CAMELBACK PLANT consisting of 4 mills, one calender, one tuber, conveyers, and miscellaneous small equipment. Will be sold with or without inventory. Address Box No. 973, care of INDIA RUBBER WORLD.

AIR BAG BUFFING MACHINERY
STOCK SHELLS HOSE POLES
MANDRELS

NATIONAL SHERARDIZING & MACHINE CO.
868 WINDSOR ST. HARTFORD, CONN.
Akron Representations San Francisco New York

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Cincinnati, Ohio

Branches in all principal cities
WM. S. GRAY & CO., Distributors, New York City



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AKRON - OHIO

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does not mean cotton fiber alone

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over twenty years catering to rubber manufacturers

CAPACITY

for large production and quick delivery

CONFIDENCE

of the entire rubber industry

KNOWLEDGE

of the industry's needs

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acknowledged superior by all users are important
and valuable considerations to the consumer.

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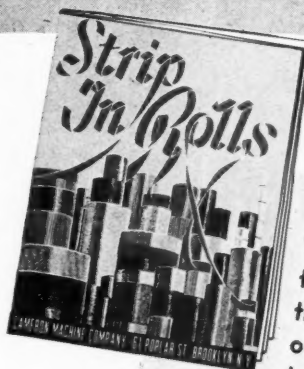
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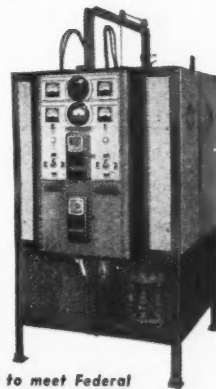
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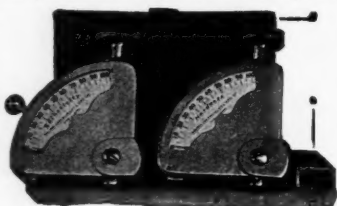
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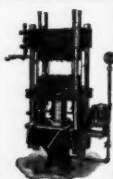
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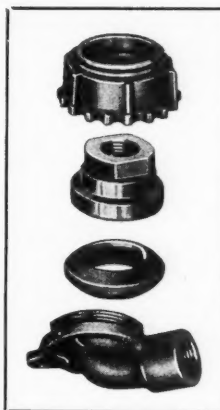
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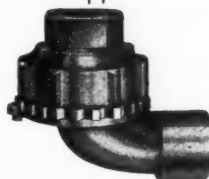
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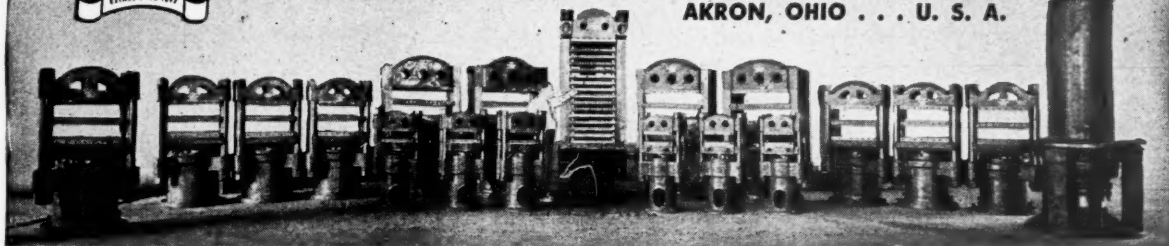
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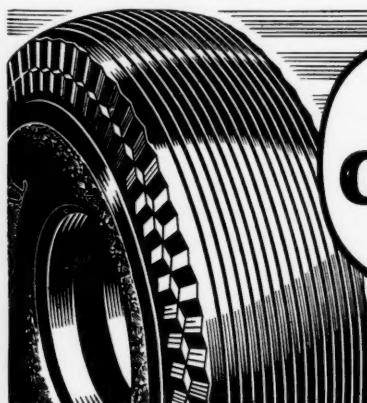
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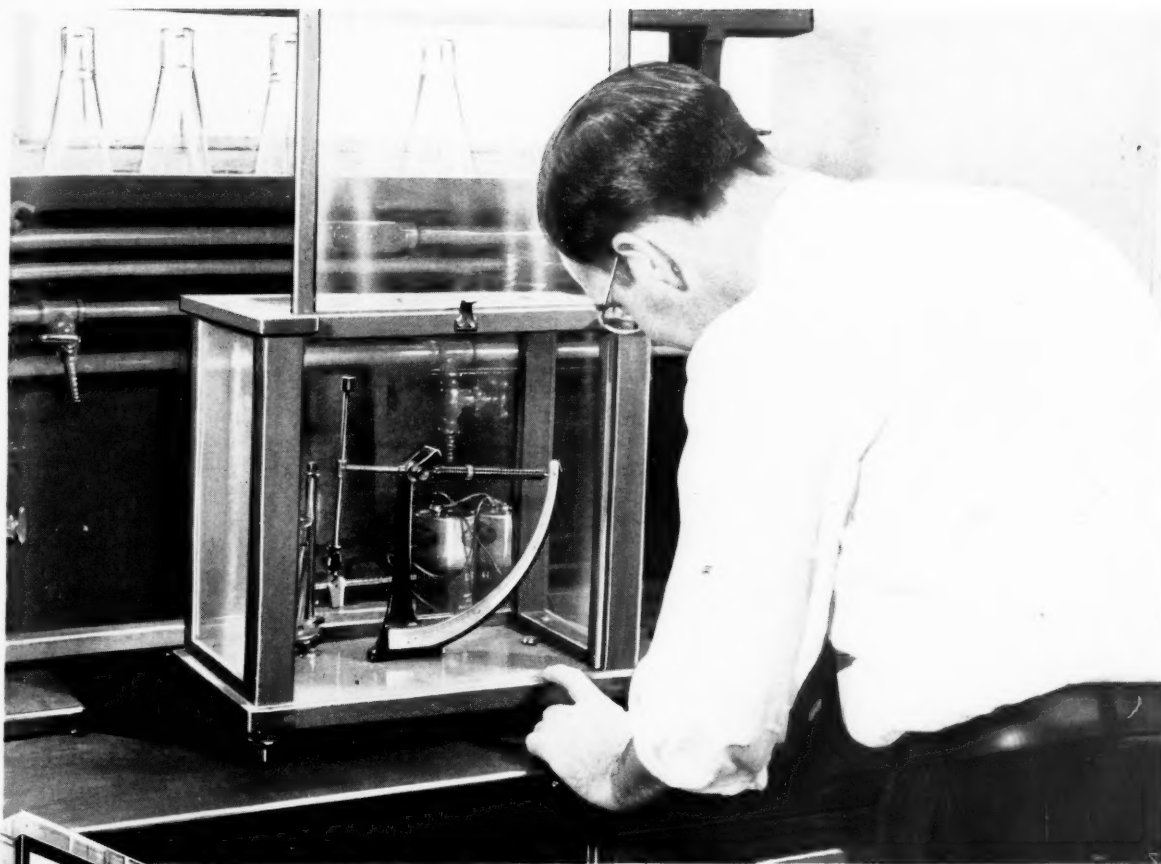
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